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CONTENTS

	PAGE
Editorials	381
Letters to the Editor	386
The Scrap Heap	387
Overseas Railway Affairs	388
Stability of Railway Vehicles	390
General Hammond's Report on the Chinese Railways	391
The Oddesund Bridge, Denmark	394
Improved Trawler Bunkering Facilities at Fleetwood	396
Day Saloon Coaches for Mar Del Plata Service, B.A.G.S.R.	398
New Articulated Locomotives, Southern Pacific Railway	400
A New Railway Shop Machine Tool	402

DIESEL RAILWAY TRACTION

A Supplement illustrating and describing developments in Diesel Railway Traction is presented with each copy of this week's issue.

The French National Railways Company

AS was expected, the French railway reorganisation plan was promulgated by decree on August 31, the last day of the French Government's special powers to legislate by decree. The effect is to set up a Société Nationale des Chemins de fer Français in which the State is to hold 51 per cent. of the shares. From January 1 next all the main-line railway undertakings, both State-operated and company-operated, will be merged into this new undertaking in which a majority of the board of directors (until 1955 to comprise 33 members) will be nominated by the Government. The remaining 49 per cent. (shares to the nominal value of about fr. 695,000,000) of the share capital will be allocated to the existing railway companies, and these will remain in existence until 1955 which is the average date of the expiration of the existing concessions. Dividends received will, of course, be used for distribution to the shareholders in the existing companies, but in 1955 these companies will be dissolved, and the shares which they hold in the Société Nationale will then be distributed to their own shareholders. The members of the board of the new company will comprise the Vice President of the Council of State; the Governor of the Bank of France, and the Director of the Caisse des Depôts et Consignations; 12 additional representatives of the State; 12 nominees of the present companies; 4 members appointed by the railwaymen; and 2 persons "who have rendered eminent railway service." From 1955 onwards the 12 representatives of the companies will be replaced by 8 directors appointed by the shareholders, and the total strength of the board will thus be reduced to 27. The General Management of the new company will be in the hands of M. Le Besnerais, with M. Surleau as Deputy General Manager.

* * * *

Railway Wages

The announcement, recorded on page 405, that the three railway trade unions and the four main-line railway companies have accepted Decision No. 3 of the Railway Staff National Tribunal is good news. The decision, dated August 9, was issued on August 11, to come into operation as from August 16 and there has necessarily elapsed a period of time sufficient to enable the parties to give the document the full consideration it deserves. At the special meetings of the trade unions there were, as was perhaps only to be expected, certain murmurings of discontent, because their claims had not been conceded in full, but those responsible for agreeing to accept the decision of the independent tribunal, to which those claims were referred, have not failed to recognise that, even so, substantial gains have been secured. The total annual cost of these concessions is estimated at about £2,900,000 and this figure does not take into account the cost of other important concessions recently agreed by the companies, such as the granting of annual holidays with pay to railway shop staff. Thus the annual salaries and wages bill of the companies will be increased by over three million pounds, a sum to earn which will call for the best that the railway staffs can give. Acceptance of the decision means that the last of the "economy cuts" agreed in 1931 have vanished and certain improvements in wages and conditions of service will now operate. Once again the effectiveness of the agreed machinery of negotiation for railway staff has been demonstrated.

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The Week's Traffics

Passenger train traffics of the two holiday lines show decreases for the past week, but for the corresponding week a year ago the Southern had a passenger increase of £13,000 and the Great Western one of £8,000. The combined increase on the four main line railways for the past week is £73,000, against £117,000 for the previous week. Passenger train traffics to date amount to £48,921,000, an increase of £2,092,000; in the merchandise earnings of £36,571,500 there is a net advance of £1,087,500; and the coal receipts of £21,673,500 show a net improvement of £1,316,500. Total traffics for the 34 weeks are £107,166,000, an increase of £4,496,000, or 4·38 per cent.

	34th Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	
	£	£	£	£	£	%
L.M.S.R. ..	+ 7,000	+ 21,000	+ 16,000	+ 44,000	+1,669,000	+ 4·02
L.N.E.R. ..	+ 12,000	− 13,000	+ 15,000	+ 14,000	+1,458,000	+ 4·85
G.W.R. ..	− 8,000	+ 19,000	+ 13,000	+ 24,000	+ 876,000	+ 5·09
S.R.	− 7,000	+ 500	− 2,500	− 9,000	+ 493,000	+ 3·53

On the Mersey Railway the increase for the past week was £43, bringing the improvement for the 34 weeks to £5,018.

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Four Generations of Railwaymen

The recent passing of Major J. C. G. Spooner, Chief Engineer, Way and Works, Federated Malay States Railways (recorded on page 403), marks the completion of a connection with railway engineering that has extended over four generations, and began in the very early days of railway enterprise. James Spooner, the first engineer of the Festiniog Railway, was a pioneer in narrow-gauge construction when he adopted a gauge of 1 ft. 11½ in. for the famous Festiniog Railway in North Wales, which he built during the years 1833 to 1836. His son, Charles

Easton Spooner, succeeded him as Engineer and also General Manager of this railway, introduced steam traction and Fairlie locomotives on it, and thus secured world-wide fame for a small steeply-graded slate-quarry railway. C. E. Spooner left two sons, both of whom occupied railway engineering offices. One was George Percival Spooner, the Locomotive Superintendent of the Festiniog Railway and the designer of some of its Fairlie engines, who afterwards entered Indian railway service. The other was Charles Edwin Spooner, well known as General Manager of the Federated Malay States Railways. His son, Major J. C. G. Spooner, joined the service of that administration in 1903, and remained with it throughout his career as a railway engineer; his appointment as Chief Engineer, Way and Works, dates from 1929.

* * * *

Ceylon Government Railway

Receipts of the Ceylon Government Railway during the year ended September 30, 1936, were again seriously affected by unregulated road competition. The report, by Mr. W. G. Hills, the Acting General Manager, although only recently published, was written before the report of the Hammond Commission was available. Remedial measures to be adopted will be the introduction of light units and railcars to give a faster schedule, the extension of collection and delivery services, the speeding up of trains generally, and the provision of reasonable rates and improved terminal facilities.

	1935–36	1934–35
Passengers	9,406,977	10,217,300
Merchandise, tons	895,238	988,484
Train-miles	4,267,976	4,205,212
Operating ratio, per cent.	114·48	101·35
	Rs.	Rs.
Passenger receipts	5,917,331	6,547,579
Merchandise receipts	9,189,755	9,962,611
Gross revenue	16,749,221	18,273,081
Ordinary working expenses	19,175,163	18,520,001
To renewals fund	412,651	391,325
Deficit	2,838,593	638,245

Interest charges of Rs. 6,284,031 bring the total deficit for the year under review to Rs. 9,122,624. Steam railcars were run on twelve sections during the year, or "baby trains" in some cases in lieu of railcars withdrawn for repairs.

* * * *

The Development and Reform of the Chinese Railways

In a foreword to the report by Brig-Gen. Hammond on the National Railways of China—a summary of which we publish on page 391—His Excellency Dr. H. H. Kung, Vice-President of the Executive Yuan and Minister of Finance in the Government of China, refers to railway building as one of the cardinal projects in Dr. Sun Yat Sen's programme of reconstruction for China. Dr. Kung himself was also impressed with the urgent need for railway expansion, when he visited Europe and America in 1932-33, and he foresaw that without an adequate system of railway transport China must be very slow in her national development. He also realised that the railways of his country not only needed drastic improvement, but that their default of loan obligations had reflected upon China's credit abroad. With the concurrence of General Chiang Kai-shek and the President of the Executive Yuan in these views, and the approval of the former to immediate investigations into the condition of the railways as it then was, Dr. Kung secured the services of General Hammond to study the question. The report was duly written and presented, and already during the two years that have since elapsed many improvements on the railways have been initiated. Chief among them, perhaps, is the appointment of a central workshops organisation, referred to in our Overseas columns of April 23 and 30 last, which is preparing to take over some of the best-equipped railway workshops and concentrate in them repairs of engines and rolling stock from all the National lines. This work will be facilitated by the standardisation of parts, referred to by Mr. Kenneth Cantlie in his address upon the Railways of China, summarised in our issue of May 14. Though reforms in the National Railways were in hand prior to General Hammond's visit to China, his recommendations must have greatly strengthened the hands of the reformers whose work will now, under the present unfortunate conditions of conflict with Japan, be seriously impeded.

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A Midland Metamorphosis

With the most comprehensive programme of timetable reorganisation that has been so far carried out, the L.M.S.R. at one blow has removed practically every cause for the complaints that have been voiced for some time past, both in our own columns and in those of the general press, as to the train services on the London main line of the Midland Section. The new winter timetable which comes into force on September 27 incorporates, as may be seen from our summary on page 406, radical alterations and accelerations of as much as 42 min. in a single journey. To some it may have seemed that the L.M.S.R. has been slow in carrying out this much needed improvement of its train service, but it must be remembered that a great deal of preparation is necessary before embarking on so large an undertaking. Such is the magnitude of this scheme, indeed, that it may be compared with that introduced in October, 1914, by the late Sir Henry Thornton on the former Great Eastern Railway. Sir Henry's ambitious programme, however, owing to inadequate preparation, was unfortunately short-lived, but the preparations of the L.M.S.R. have been thoroughly undertaken and the scheme placed upon the firmest of foundations. There is now an adequate stud of powerful modern six-coupled locomotives available, the introduction of which necessitated a good deal of preliminary bridge strengthening; and great as the accelerations are to be, they are not planned so as to allow of no margin for time-recovery. The new timetable is generally most attractive on paper, and should prove equally efficient in operation. We now look forward to similarly thorough timetable revisions as soon as they may be practicable on other sections of the L.M.S.R. that have not yet received attention.

* * * *

"Vacation With Pay" Tickets in France

A sign of the times is the introduction on the French railways of a special reduced-fare ticket for workers on annual vacation with pay. The importance of the new legislative concession to workers in France, of an annual holiday with full pay, was immediately recognised by the railway companies and a special ticket with a reduction of 40 per cent. on the ordinary fare was introduced, with the most gratifying response in the form of a large number of excursionists who had not previously been able to travel. In other words, this is an entirely new source of revenue. The French railways are responding in other ways to the public desire for travel, and publicity is now being given to the increased number of special bookings and services available. Many of these are on similar lines to the special bookings in this country and the English railways may feel flattered by what in some cases appear to be an imitation. On the other hand the French have more intensive train service on Sundays, with rather greater activity at holiday centres, and there are many Sunday excursions to the seaside and "week-end" (*sic*) trains.

Recent innovations also are special trips to mountain and forest, and " journeys to the snows," all affording opportunities in increasing degree for the worker to get away at small expense from the scene of his labours, and to become better acquainted with the natural beauties of his country.

* * * *

The Swedish State Railways in 1936

Traffic returns of the Swedish State Railways for the year 1936, just published, show all-round improvement, with iron ore transports from Lapland particularly increased in comparison with 1935. After allotting 19·5 million kronor to the renewals fund and refunding 2 million on the ore line, the State Railways during the year 1936 showed a surplus in accounts of 39·2 million kronor against 35·1 million for 1935. The average State capital at the disposal of the State Railways in 1936 was 1,347·4 million kronor, on 820·3 million kronor of which interest was to be paid out of income to a total of 32·6 million kronor. The operating results of the State Railways for the year thus provided for the above interest and produced a net surplus of 6·6 million kronor. Continued electrification, it is stated in the report, has enabled considerable further improvements to be made in transport facilities during the year, especially as regards communications between Norrland and Central and South Sweden. The introduction of railbuses on lines of small traffic density has been considerably extended during the year.

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Fly-Catching Trains

More than a year ago trains were enlisted in the service of members of the staff of the University College, Hull, who are engaged on investigating the flights of insects which are agricultural pests. Mr. A. C. Hardy, Professor of Zoology, is in charge of the operations and last year his equipment consisted of a galvanised cylinder inside which was a conical-shaped muslin bag with a glass tube inserted at the apex. This cylinder was fixed to the side of a guard's van and when the train was in motion floating insects were drawn into the net and dropped in the glass tube, after which they were rendered inactive by insertion in a jar containing cyanide of potassium. This year Professor Hardy is continuing his investigations into the characteristics of the countryside between York and Hull covering the same ground as last summer, but using a more elaborate trap. The new equipment, which is fixed on the six-foot side of a goods brake van, is in the form of a net with a rectangular mouth 4 ft. high by 1 ft. wide. The net tapers to a 1 ft. circular opening behind which is an interchangeable net fitted with a small glass tube into which the insects filter. The small net and tube are changed at fixed intervals, and details of the catch recorded. The L.N.E.R. is cordially co-operating in this interesting investigation from which it is expected that data will be secured that will materially assist farmers.

* * * *

Improvements at Fleetwood

On page 396 of this issue will be found an illustrated article dealing with the modernisation scheme of the L.M.S.R. docks at Fleetwood. This scheme, involving an expenditure of £85,000, includes the installation of six high-capacity coaling plants, the use of which reduces the time required for bunkering a trawler with 80 tons of coal by no less than 2 hr. 50 min. Previously the coaling of trawlers at Fleetwood was performed by crane and bucket methods, and it took 4 hr. to transfer the 80 tons of coal to the vessel, whereas with the new plant the same operation occupies only 1 hr. 10 min. These quicker coaling facilities substantially reduce the time for which trawlers have to lie over between trips, and will enhance the competitive power of Fleetwood vessels from a market point of view. The figures quoted represent average working times, and include that required to trim the bunkers and for other stoppages. The actual capacity of each plant over a short period is at the rate of 200 tons an hour, but of course it is not possible to maintain this over an extended period, due to stoppages for various reasons not directly connected with the plant. Every plant is arranged as an independent unit, with its own set of sidings to accommodate 30 loaded and 30 empty coal wagons. In these sidings both tracks are laid parallel and graded up to a discharge point over a distance of 60 yards at an average of 1 in 90. The methods used in the manipulation of the wagons, and indeed, all the operations concerned with the coaling plants, are of the latest and most approved type, and the plants are proving themselves highly efficient in coaling fishing vessels.

* * * *

Hand Reversing Forbidden in America

The Interstate Commerce Commission has issued an order requiring the installation of power reversing gear on all steam locomotives built after September 1 of the present year, and further specifying that all main line locomotives built prior to that date and having a weight on coupled wheels of 67 tons or more, as well as all shunting engines with 58 tons or more on their driving wheels, shall be equipped with a suitable type of power reversing gear when they are first shopped for major repairs after that date. The order goes even further in requiring that *all* locomotives in the categories mentioned shall be so equipped before September, 1942. Other provisions are that where steam connections to air operated gears are used, the operating valves shall be conveniently located in the cab of the locomotive, and so arranged and maintained that in case of air failure steam may be quickly used to operate the reversing gear. It is held by the commission that the use on steam locomotives of manually-operated reversing gears causes unnecessary peril to life and limb, and that the safety of employees and travellers on the railways requires that suitable power-operated reversing gear shall be substituted for manually-operated gear. The report estimates the cost of installing power reversing gear on locomotives not already possessing it at $5,000,000 (£1,004,016), and the view is expressed that this outlay for so equipping the engines will not be unduly burdensome to the railways.

* * * *

" Urbs in Rure "

The city worker—who we are often told " is doomed as the slave of Mammon to spend his working days in a sunless and airless office and his leisure in a dull dwelling—the dreary counterpart of scores of similar houses in a featureless suburb "—has maybe often turned his thoughts yearningly to the Eden-like joys of life on a farm. He may even have gloomily compared his artificial existence with the simple, natural, and homely life of those who, engaged in agricultural pursuits, labour in the open air. Possibly aware of these sentiments, the New York Central System has assumed the role of benevolent uncle and has attempted to achieve something towards his emancipation. Acting as an introductory medium to bring " smart alec " and " country bumpkin " together, the company recently ran an excursion from Chicago to a large farm in Southern Michigan. The farm was in full operation so that the city folk could learn the secrets of a vocation which feeds them. Rural play, as well as work, in full swing was shown by such sports as horseshoe pitching.

The Birth of French Railways

SOME years ago *Le Bulletin P.L.M.* recorded that M. Daubenton, returning to Creusot from a visit to the mines of Mont-Cenis, wrote in 1782 to M. de Buffon: "All the roads there are marked out by pieces of wood, to which are attached cast-iron plates on which run the wheels of the wagons which carry the coal; these wheels are so placed (or of such a form) that the wagon cannot turn aside and must follow the route traced for it. Thus a single horse, even a blind one, can without trouble draw 4,000 (kg.) and more." It would appear that the use of iron railways in France was introduced from England, for we find it stated* that "The first rail-road in France was a small one at Mount Cenis, constructed, in 1783, by an Englishman named Wilkinson, for the use of the foundries of Creusot." This was presumably the famous ironmaster John Wilkinson, of Broseley Ironworks, Shropshire, called by many the father of the iron trade, for he carried out a number of works in France at this time and erected a Watt engine—one of the earliest in France. He wrote to Watt in a letter dated "Crusal (*sic*), September 13, 1785," that "The engine is in operation. The Frenchmen are delighted. It is a complete success." We do not know whether contemporary evidence exists which clears up the slight discrepancy in dates, but some reader may know of sources of information throwing light on the subject.

Presumably the use even of mining railways did not become widespread, for a French traveller named Saint-Fond, who visited Newcastle-on-Tyne in 1791, wrote† in terms of praise of the colliery wagon-ways there, and described the wooden rails as being formed with a rounded upper surface, like a projecting moulding, and the wagon wheels as being made of cast iron, and hollowed in the manner of a metal pulley that they might fit the rounded surface of the rails. He strongly urged the French to adopt a similar means of conveyance, but the succeeding period of the Revolution was not conducive to industrial development. Nor, in fact, was the military régime of the first Napoleon, and so nothing resulted from a memorial presented to the Emperor at the beginning of 1814 by M. Pierre Michel Moisson-Desroches, a mining engineer, on the possibility of expediting transit by building a network of seven great iron tramways. Actually the proposal seemed likely to interest Napoleon, who was accustomed to say that one could "measure how public prosperity was progressing by the profits of the stage coaches," but the Emperor's abdication on April 5, 1814, deferred any such schemes. The founder and first *directeur* of the Ecole des Mineurs de Saint-Etienne was a notable engineer named Louis Antoine Beaunier, and Moisson-Desroches served under him.

An impetus to French railway construction was given in 1818 by a lengthy "Notice sur les Chemins de fer Anglais" presented to the Académie des Sciences by M. de Gallois, a Government surveyor of mines, following a visit to the Wylam wagon-way and to the Middleton colliery line upon which Murray's locomotives were running successfully on Blenkinsop's rack rail. Three years later the propaganda of de Gallois resulted in an application (on May 5, 1821) to the Government for powers to build a railway between Saint-Etienne and Andrézieux on the river Loire. This was presented by Beaunier in conjunction with five leading industrialists and mine-owners in the Saint-Etienne district (MM. de Lur-Saluces, Boigues, Milleret, Hochet, and Bricogne), and the petition was eventually granted by Louis XVIII personally on February 26, 1823. The concessionaires formed the Cie. du Chemin de fer de Saint-Etienne à la Loire on June 3, 1824. It would seem that traffic began on this line at the end of May, 1827, although the official opening for public traffic did not take place until October 8, 1828; until 1844 only horse traction was used. On August 21, 1827, the Countess Bertrand traversed the line in a coach, but public passenger traffic began only on March 1, 1832. This railway, and other similar lines in the neighbourhood of Saint-Etienne, had been in successful operation for a number of years before rail transit extended beyond the narrow confines of the mining districts and was introduced to the French metropolis. It was not until July 9, 1835, that the first concession was granted for a railway in the neighbourhood of Paris, and this line—from Paris to Saint Germain—was opened on August 26, 1837, exactly a century ago. This railway (to which reference is made in our Scrap Heap columns on page 387) was really the first French railway in the modern sense of a line upon which both passengers and goods were transported by mechanical power, and it is a noteworthy coincidence that the beginning of the second century of French railway enterprise should mark also the grouping of all the main lines into one organisation (under State control) called the Société Nationale des Chemins de fer Français, to which we refer in our first editorial note this week.

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Paris-Orleans and Midi Railways

WORKING results of the Orleans and Midi Companies for the year 1936, under the pooling arrangement initiated in 1934, are published in the form of a joint account, although each company has its separate report. The proportion accruing to the Paris-Orleans Company out of the joint gross receipts was fr. 1,367,405,374. Expenditure, with financial charges and the statutory appropriation for dividend, amounted to fr. 1,798,121,589, leaving a deficit of fr. 430,716,215, which with the addition of fr. 40,454,839 for *charges intercalaires*, represents the claim of the company on the common fund for 1936. Corresponding figures for 1935 were fr. 368,084,374 and fr. 24,472,922, respectively. With the addition of fr. 6,360,279 from the shareholders' property reserve fund (*domaine privé*) to the statutory appropriation for dividend and *prélèvement* of fr. 34,239,160, a dividend is available of fr. 67 and fr. 52 on the two classes of shares respectively. For 1935 the corresponding dividends were fr. 68 and fr. 53. The amount pertaining to the Midi out of the joint earnings was fr. 685,930,217, and disbursements, including working expenses and all financial charges, amounted to fr. 1,034,654,983, leaving a deficit of fr. 348,724,766, which with fr. 27,484,477 for *charges intercalaires*, comprised the total deficit for the company to be made up out of the common fund. The corresponding figures for 1935 were respectively fr. 340,028,854 and fr. 23,437,398. With the inclusion of the amount corresponding to the *prélèvement* the dividend is fixed at fr. 50 a share, the same as for 1935.

Working statistics are available only for the two companies' systems as a whole. Passenger traffic was less by 1,168,328, or 1·55 per cent. in number and by fr. 11,435,143, or 1·97 per cent. in receipts. This was principally accounted for by the conflict in Spain. The extension of rail motor services and the increased number of reduced fares (especially those created to meet the new feature of vacations with pay) are expected to show an improvement in the figures for the present year. The distribution of passengers in the three classes was as follows: 0·65 per cent. in the first; 6·10 per cent. in second;

* "The British Cyclopædia of the Arts and Sciences," by Charles F. Partington. Published in London in 1835

† "Travels in England, Scotland and the Hebrides," translated from the French. Vol. 1, page 142-6

and 93·25 per cent. in third. The corresponding distribution in 1935 was 0·76 per cent. first, 6·29 per cent. second, and 92·95 per cent. third. On the basis of receipts, however, the figures were respectively 4·35 per cent., 16·63 per cent. and 79·02 per cent., comparing with 4·87 per cent., 17·90 per cent., and 77·23 per cent. in 1935. The acceleration in running times continued in 1936, especially between Paris and Port Bou where 36 minutes has been gained, and Bordeaux and Irun, where the timing is improved by 20 minutes.

Merchandise receipts improved over 1935 by fr. 29,890,177, or 2·11 per cent., and it is hoped that the new Commercial Office (*Service du Trafic*), organised in the previous year will continue to give good results. The accompanying statistics refer to the joint service of the two companies:—

	1936	1935
Kilometres worked	11,655	11,615
Train-kilometres	90,779,131	87,979,439
Passengers	74,084,118	75,252,446
Operating ratio, per cent. ..	99·18	98·43
	Francs	Francs.
Passenger receipts	566,146,091	577,581,234
Merchandise receipts	1,446,439,341	1,416,549,164
Gross receipts	2,053,335,591	2,040,945,443
Working expenses	2,036,589,096	2,008,938,255
Net earnings	16,746,495	32,007,188

Of the length in operation 4,290 km. were on the Midi system in both years. The increase from 7,325 km. to 7,365 km. on the Orleans is due to the fact that the line of 40 km. from Villeneuve-sur-Lot to Falgueyrat formerly operated on capital account was brought into full working on revenue account in 1936. Allowing for the *prélèvements* granted in the decrees of 1935 and 1936 the operating ratios were 97 per cent. in 1936 and 96·10 per cent. in 1935. Merchandise receipts in 1936 were not shown separately under *grande vitesse* and *petite vitesse* as in former years, but were made up of fr. 1,034,056,940 *charges complètes* (in car loads), and of fr. 412,382,401 *autres transports*. Unfortunately, no definite plan has yet been approved by the Ministry for co-ordination of road and rail transport, and the commission has been radically modified by the decree of November 14, 1936. The railways are still suffering from the unbridled competition of the roads while unable to suppress or modify services on secondary lines although in many cases these have been superseded by parallel road traffic. On the other hand expenses were again higher as every increase in receipts obtained by improvements in the service given to the public is more than counterbalanced by increasing costs principally due to rising cost of materials and modern social legislation, such as the 40-hr. week, paid vacation, &c.

Among the important works in hand on the Orleans system are the alterations at Nantes, the electrification of the line between Tours and Bordeaux (expected to be completed next year), and the installation of automatic colour-light signalling between Bretigny and Les Aubrais. Electrically-operated traffic on the Orleans in 1936 amounted to 17,005,326 train-kilometres, or 30·20 per cent. of the total, apart from railcar traffic. Plans for electrification between Tours and Le Croisic are under consideration. On the Midi 18,874,446 train-kilometres, or 63·32 of the total apart from railcar traffic, were operated electrically during 1936. Stock in use on standard-gauge lines of the joint system in 1936 included 2,807 steam locomotives, 577 electric locomotives, three locotractors, 5,606 passenger carriages, 90,958 goods vehicles, and 107 containers. Owing to the determination of contracts in the Landes and Gironde districts the Société des Transports Auxiliaires des Chemins de fer du Midi worked only 389 km. of bus routes in 1936, against 1,196 in 1935. The goods road services worked in connection with the railway company show, however, continuously improving results.

The Conveyance of Iron and Steel

EFFICIENT transport is a vital necessity to the satisfactory functioning of the iron and steel industry. The extent to which the British railways are contributing to its requirements in this respect can be judged from the fact that last year they conveyed more than twenty-seven million tons of iron and steel traffics, ranging from iron ore and other raw materials to finished products of multitudinous shapes, weights and sizes. While the mineral resources of Great Britain are used to a large extent in the production of iron and steel, very heavy tonnages of raw materials such as ore, pig-iron, scrap-iron and semi-manufactured iron and steel are imported and conveyed by railway from the ports to the smelting works situated throughout the country. Supplies of coal, coke and limestone are drawn from many places in Great Britain; and finally the finished products have to be conveyed from the steelworks to destination. Apart from special wagons, such as the hoppers used extensively for the conveyance of iron ore, thousands of wagons of all descriptions are maintained for the carriage of castings, pipes, ingots, angles, bars, rails, rods, plates, billets, girders and joists. These include extra long bogie fitted wagons for carrying lattice girders or long rails; while wagons in two sections, capable of extension, are supplied for the conveyance of bridge girders. For articles of exceptional dimensions such as propellers, boilers, forgings, &c., various types of well wagons are used, the largest of which can carry a weight of 150 tons spread over 56 wheels by means of a cantilever arrangement.

Rationalisation and reorganisation have been notable features of the industry during the past few years, and the railways have kept pace with these developments by the provision of improved and additional terminal accommodation, the construction of additional and new types of freight vehicles, and the widespread acceleration of freight train services. In addition to meeting successfully the heavy obligation of carrying these vast tonnages efficiently, the British railways are also among the largest customers of the iron and steel manufacturers in this country. Something like 1,300 miles of railway track are renewed annually, necessitating the purchase of over 200,000 tons of steel rails, while very substantial orders are also placed for iron and steel in connection with the companies' maintenance and constructional work, as well as for steel sleepers.

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Non-Ferrous Brake Blocks

THE reference made to non-ferrous brake blocks on page 223 of our issue of August 6, has drawn from a correspondent who is in a position to speak with authority, the comment that any mention of the kind can hardly be regarded as complete which does not take into account the researches and experimental work in this direction carried out during the past several years by the engineers of the London Underground railways. It is true that the author of the paper, which formed the basis of the remarks we made on the subject, had himself little or nothing to say regarding these researches and work, and it was left to one or other of those taking part in the discussion on the paper to ask for information respecting them. It is of course known that non-ferrous brake blocks suitable for running on outside sections have been developed on the Underground railways of the London Passenger Transport Board, and it is of interest to add from the information provided by our correspondent, that it was formerly the practice on these railways to use non-ferrous brake blocks only in tunnel sections, as the blocks

at that time were not suitable for running under wet conditions. In April, 1926, after getting in touch with brake lining manufacturers, the engineers of the Underground railways decided to see whether non-ferrous brake blocks could be developed suitably for running under both wet and dry conditions. Most of the manufacturers of brake linings were approached, and attempts were made to evolve a material which would give the required results.

Considerable difficulties arose, but in October, 1928, a firm supplied the Underground railways with a block which gave the desired results. The cost of this block was, however prohibitive, and ultimately it was found that its construction made it unsuitable for railway work. Meanwhile, further tests and experiments had been made, and in October, 1928, blocks made by another firm were acquired and placed in service for extended tests. In April, 1932, non-ferrous brake blocks were adopted as a standard for lines running into the open. It is thus obvious that the pioneer work in this direction has been done almost, if not entirely, by those responsible for the braking equipment used on the Underground railways, and the fact that other railways, including main lines on which high speeds are attained with very heavy trains, are now looking into this matter and carrying out experiments of their own, is a further acknowledgment of its importance. A tremendous amount of heat has to be dissipated, and this, as the author himself pointed out, must pass through the wheel. It is therefore of interest to consider whether any effect has been noticed due to this heat on the shrinking stresses on which the tyre fixing depends. Non-ferrous blocks, because they do not cause so much wear on the wheel treads as blocks of cast iron, generate less heat. At the same time they polish the treads, and it is not inconceivable that, where very high acceleration rates are required, wheels so braked might tend to slip.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

Named Expresses from Marylebone

London, August 17

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—The possibility that the appearance of the forthcoming winter timetable will reveal substantial accelerations in the service of express trains between Marylebone, the Midlands, Lancashire, and Yorkshire, makes this perhaps an appropriate moment to suggest that the long deserved distinction of names should be received by some of these trains. The title "Cotton Cities Express" given to one of the Manchester trains, and "Wool Cities Express" to one of the Huddersfield, Halifax, and Bradford trains would no doubt prove excellent publicity for the services to East Lancashire and West Yorkshire. "Queen of the Midlands" is a proud title to which the cities of Leicester and Nottingham lay rival claims and would be a happy choice for a named train. Sheffield too should not be neglected. The future appearance of a stainless steel train (which could be largely manufactured in the district) bearing the title "The City of Sheffield" would be an event in the history of Sheffield and would give the L.N.E.R. in that city publicity of the most desirable kind.

Yours, etc.,

"VITESSE"

PUBLICATIONS RECEIVED

Steels for the User. By R. T. Rolfe. London: Chapman & Hall Limited, 11, Henrietta Street, W.C.2. 9 in. × 5¾ in. × 1¼ in. 280 pp. Illustrated. Price 21s. 0d. net.—In his preface the author of this admirable text-book rightly stresses the lack of literature concerning carbon steels and their uses, and he is to be congratulated on the ability with which, in a single volume of modest size, he has correlated the mass of data available and has compressed it into what may well be described as a miniature encyclopædia on this important subject. The author also remarks in his preface that a fundamental difficulty is that such books as do exist are usually written by scientific men who are not always fully-conversant with industrial requirements, and he might have added that the scientists often have the knack of wrapping up their information in language of such technicality that the user without metallurgical training has but scant prospect of finding in their books the information that he needs, and often at short notice. This is not so in this book, however; as a user of steel himself the author, with wide practical experience, has put his facts together, and the result is a compendium, clearly written and concisely arranged, that should be at the elbow of every user of steel. The book has the one limitation, not indicated by its title, of dealing exclusively with steels used for mechanical purposes, tool-making, and, in general, special steels with their properties and treatment, rather than structural or rail steels, and so far as railway users are concerned, therefore, the book is likely to be of more use to the mechanical than to the civil engineer.

CECIL J. ALLEN

Dismantling and Demolition.—We have received from George Cohen, Sons, & Co. Ltd., the well-known firm of metal merchants, a delightfully produced souvenir booklet forming a pictorial record of the firm's multifarious activities as dismantling and demolition contractors. The frontispiece is a reproduction in colour of a contemporary print of a most ornately decorated early U.S.A. locomotive; so rich indeed are the mouldings on this almost incredible machine, so opulent the filagree work, so chaste the lines of the safety valve and dome, and so noble and airy the proportions of the cab, that to place it in the prosaic round of everyday service savours of Philistinism. Affixed to the engine is a plate bearing the words, "Amoskeag Mang. Co., Manchester, New Hampshire, C. W. Baldwin, Agent. 1856." At this date, it is pointed out, the predecessors of George Cohen's were already established. There is a good deal more in demolition work than "keeping on hitting until nothing else is left to hit." As this book says, it demands a considerable knowledge of engineering, estimating, labour costing, architecture, and building construction, and often of local geology. All are valueless, however, without that special knowledge which years of experience can give. In the following pages are illustrations of absorbing interest of some of the major problems tackled by the firm in recent years.

Low-Load Power Trucks.—Petrol- or diesel-driven power trucks, for which special economy of operation and ease of loading are claimed, are illustrated and described in a new catalogue which has been sent us by F. C. Hibberd & Co. Ltd., Coronation Road, Park Royal, London, N.W.10. The power units (8 h.p. petrol or 10 h.p. diesel) drive the trucks through a gearbox providing one or two speeds forward and reverse. Close-set driving wheels give the manœuvrability of a three-wheeler. The controls are very simple to operate, and braking is automatically applied when the pedals (which operate the easy-change constant-mesh gearbox) are released. These trolleys will haul several trailers, and their own load capacity is high owing to the placing of the driving seat in a position which leaves the whole platform free. The catalogue also describes the 10-h.p. Planet tractor, a pneumatic-tyred unit for trailer haulage

THE SCRAP HEAP

STUNT TRAINS

The few dollars of extra revenue which the railroads take in from the operation of photographic trains, specials for fans and excursions via unusual routes would probably vanish quickly into red ink if the time of railway officers who accompany these trips were charged against them. But when the space freely given by newspapers, newsreels, and other publicity outlets is credited to the stunt trains, as it should be, is there any other recent example of railroad enterprise which is proving more profitable?—*From the "Railway Age."*

* * *

VERY LIKELY.

The length of the lines in the Japan railways has been found to contract several miles per year. The effect has nothing to do with normal expansion and contraction from heat and cold. It is a mystery at present where the lost length goes, but the most likely theory is that the constant vibration set up by trains gradually breaks down the original stresses within the steel and enables the particles to lie closer together.—*From the "News-Chronicle" of August 5.*

* * *

Has anyone ever stopped to think how much the railroad train means, in terms of romance and colour, in the lives of people who never ride on it? People who are tied down, in crowded cities or on lonely prairies, get their vicarious escape through the speeding trains that pass them by. These trains stand for escape, for freedom, for purposeful movement; they stand for the passing of invisible horizons just as surely as Drake's ships stood for that to the home-bound people of Devon, centuries ago. So wherever you go you find people looking up from their work or play to lift a hand at the passing train as it flies across the landscape with the lonely, haunting echoes of its whistle trailing over its shoulder Those lifted hands are a salute to dreams by dreamers who must stay at home.—*From the Pittsfield (Mass.) Eagle.*

* * *

FLY-KILLING COMPETITION

A novel competition has been organised by the Kiaochow—Tsinan Railway in China to encourage its staff to reduce the pest of flies that is making the lives of passengers burdensome, and is detrimental to sanitation and health. Prizes for the best killers are to be awarded at the end of the campaign.

* * *

The train (in Ireland) had been held up for several minutes and the guard was tired of answering questions. "What is wrong, guard?" asked yet another passenger, an important-looking young man. "Well, sir," said the guard, confidentially, "the signalman over there has got red hair and we can't get the engine to pass the box."

One Hundred Years Ago

Extracts from the September, 1837, issue of "The Railway Magazine" (afterwards "Herapath's Railway Journal") and the oldest constituent of THE RAILWAY GAZETTE

Grand Junction Railway.—This noble undertaking is already paying most handsomely, although the Company have not yet begun to carry goods, and although the London and Birmingham line is not yet open.

Birmingham Railway.—Complaints were at first made of the want of accommodation, &c. The public do not consider the extreme difficulty of perfect arrangement in the outset of a great undertaking like this. We are, however, pleased to hear that these troublesome, though small points, have been got over, and that ample accommodation is now afforded. The trains occasionally take immense loads; as many as 40 carriages have been taken in one train. We beg again to remind our readers, that no just estimate can be formed of this or the Grand Junction line, until the whole shall have been finished, and a complete railway communication established between London, Birmingham, and Liverpool and Manchester. The daily receipts in the part opened have increased to £189.

Great Western Railway and the Landowners.—We lay before our readers the results of two trials lately decided at Bath, as specimens of the properly liberal feelings on the part of railway Companies, and the modest claims of landowners. James Grant Smith, Esq., claimed for land taken by the Great Western Company, and compensation, £6,780, the Company offered him £4,500 for the mere purpose of saving litigation. This would not satisfy him; he went to a jury, which gave only £4,223. Lord Manvers, again, claimed £9,000; the Company generously offered him £4,500, but the jury decided that £3,375 was quite enough.

Taff Vale Railway and Lady Charlotte Guest.—The first stone of the Rhondda bridge, at Newbridge, was laid with workman-like skill by Lady Charlotte Guest, on the 16th ult. As we have a lady Monarch, it is not unfit to have a lady mason; it is indeed quite evident Venus is become lady of the British Ascendant.

Brussels and Antwerp Railroad.—During the month of June, and the first ten days of July, the number of passengers by the railroad from Brussels to Antwerp was 172,631, and the receipts amounted to fr. 152,519.

French Railway.—The French Chambers have just voted a railroad from Alais, in the mountains of Cevannes, to Beaucaird on the Rhone, passing by Nismes. The Government lends £240,000 to the undertakers, the latter promising to furnish coal to the French Government steamers at Marseilles at 20 per cent. under the present price. By means of this railroad English coal is to be undersold at Marseilles; and, according to the report, these mines were to supply, not merely the Mediterranean ports, but Bordeaux itself.

Military Employed on Railways in France.—By the decision of the French Minister of War, all the Paris regiments have been authorised to furnish to the railway companies from Versailles soldiers to be employed on the works. The detachments thus employed are to be relieved by others every three months until the lines shall be complete. Preparations have already been made in the Park of St. Cloud for the portion of the railway which is to pass through it.

Railroad from Paris to St. Germain.—On Sunday last the railroad from Paris to St. Germain may be said to have been opened in its full extent, a train of carriages, containing the Minister of Finance, the Duke de Cazes, several members of the Institute, and other persons of distinction having proceeded the whole length of the roads. The length of the railroad is 18,430 metres, or 4¾ leagues (11½ English miles), which the train passed over in thirty-five minutes, returning in twenty-nine minutes. The greatest rapidity with which the party went was at the rate of 14 leagues an hour. Only one pair of rails have yet been finished, and it appears that the company intend opening the railroad to the public without waiting for the second. In its course the St. German Railroad passes under two tunnels, and along two-thirds of the line it is raised on a viaduct of from fifteen to twenty feet high. It crosses the Seine twice, and passes over or under no less than fifteen roads. The rails are represented to be of unusual strength, those on the Liverpool Railroad weighing only thirteen kilogrammes, while those on the St. Germain weigh no less than thirty. The Paris tunnel is 550 feet in length, that of the Batignolles 960 feet. The whole of the works as far as they have yet gone, have occupied only eighteen months. The railroad to Versailles is, however, expected to be the most profitable, the daily number of passengers being between 11,000 and 12,000.

OVERSEAS RAILWAY AFFAIRS

INDIA

Railway Accounts Examined

The Public Accounts Committee, sitting recently at Simla under the chairmanship of Mr. J. C. Dixon, Acting Finance Member in the Viceroy's Executive Council, discussed the Auditor-General's memorandum on the railway appropriation accounts for 1935-36. A statement of the action taken on the recommendations made by the committee in the previous year was also placed before the committee. The reduction of Rs. 8·31 crores in the capital at charge to railways was explained as due to the application of the current statutory rate of exchange to liabilities which had previously been converted at the rates in force at the time they were undertaken. The Auditor-General was satisfied that this writing down was necessary on correct accounting principles.

Amalgamation Considered

Prior to the meeting, a memorandum on the question of re-grouping or amalgamation of railways was circulated to the members of the committee. Most of the members were in favour of amalgamation in principle, providing that this did not result in actual loss. They considered, however, that further information should be collected on the subject and that, in the meantime, no definite decision should be taken on the recommendations made in this connection by the Wedgwood Committee.

Stores Department

In connection with the expenditure on the Indian Stores Department, the Chief Controller of Stores informed the committee that the amount of goods purchased through his organisation on behalf of both State- and company-managed railways during the year 1936-37 was considerably greater than in the previous year, and that, on the whole, he was satisfied with the position. The committee hoped that the Government would continue to utilise the organisation of the Indian Stores Department for the purchase of railway and military stores.

Vizagapatam Port Finances

The financial position of the Bengal-Nagpur Railway's Vizagapatam port formed one of the important subjects discussed by the committee, which was informed that not only was the port still unable to meet any portion of the interest charges on the capital expenditure incurred on its construction, but that it was also as yet unable to balance its budget without financial aid from the Government of India. There was some discussion on the desirability of closing down the port altogether if it was not likely to become self-supporting in the near future, but it was finally agreed that before such a decision could be reached, careful consideration should be taken of the various interests involved. The effect on the railways of closing down the harbour was one such point for consideration. The committee eventually recommended a thorough investigation into the matter so as to enable a comprehensive report to be placed before the committee next year.

N.W.R. Excursion Trains

From August 1, the North Western Railway has been running a sight-seeing excursion train from Ludhiana to Lahore and back every Sunday; it calls at Phagwara, Jullunder, Kartarpur and Amritsar. The excursionists are free to spend the day at Lahore in whatever manner they choose, but for their special benefit the railway provides a fleet of motorbuses to take them round the usual sight-seeing points for an additional charge of annas thirteen (1s. 2d.) a head. A return ticket available by this train costs only Rs. 1/4 (1s. 10½d.), or 1½ d. a mile, surely approaching a low record figure.

BRAZIL

Madeira-Mamoré Railway

The Minister of Transport has forwarded a report to the Minister of Finance, justifying the necessity for opening up a special credit of 17,514 contos, to pay the indemnisation due to this railway. [The rescission of the contract, between the Madeira-Mamoré Railway and the Brazilian Government, was referred to in THE RAILWAY GAZETTE of June 11.—ED. *R.G.*]

Estrada de Ferro São Luiz a Caxias

A very old-standing question between this railway and the Federal Government has now been settled. In 1918, the Federal Government issued an ultimatum, according to which the construction of the railway had to be completed within a period of six months, failing which the contract would be considered void. Protesting against this decision, the railway administration stated that the Government had not fulfilled its part of the agreement to supply the rails necessary for the construction, and further lodged a counter claim for damages resulting from the cessation of profits, due to the rescission of the contract, which was reputed illegal. Indemnisation for works already done, and for material taken over by the Government was also claimed.

The Supreme Court recently pronounced part judgment for the railway, and part for the Government, in that the rescission of the contract was judged legal, but, in consequence, the railway was entitled to receive the cost of all works done, and all material confiscated, less: (*a*) amounts already received by the railway in payment thereof; (*b*) all fines imposed by the Government and not yet paid; (*c*) all salaries paid by the Government in virtue of the stipulations made in clause XI of the contract. The case, as can be seen, took 19 years to be decided.

ARGENTINA

Winter Holiday Resorts

In Argentina the principal winter holiday resorts are the Iguazú Falls, the thermal baths at Rosario de la Frontera (Province of Salta), and winter sports at Puente del Inca in the Andes. But these are all expensive, and for the middle classes who have to take their holidays in winter, or prefer to do so, the Cordoba hills district is generally the obvious choice. The Central Argentine Railway has done much to increase the facilities for the winter holiday-maker, and the B.A.G.S.R. is now concentrating on making more popular both week-end and longer trips to Mar del Plata—the "Argentine Brighton"—the beautiful seaside resort on the South Atlantic. Fast trains with Pullman cars and other attractions are offered to the visitor, but the Argentine is somewhat hidebound by tradition, and it will probably cost the company time and money to popularise this resort in winter.

Tobacco Cultivation in Santiago del Estero

The Rural Development Department of the Central Argentine Railway, in co-operation with experts from the Ministry of Agriculture, is carrying on very successful experiments in tobacco cultivation in the Province of Santiago del Estero. The Government has acquired a tract of land for this purpose near Fernandez station, on the Central Argentine main line to Tucumán, and the necessary equipment and fertilising agents are being supplied by the railway. Different varieties of carefully-selected tobacco were planted, with very satisfactory results, the production averaging 1,500 kg. a hectare (2½ acres); the leaf is shown by analysis to possess all the qualities of high class tobacco. In view of the success achieved at Fernandez, the Government has now opened a similar establishment on a larger scale at the adjoining station of Forres.

The great success which has attended the Central Argentine Railway's "dry-farming" operations in the Province of Santiago del Estero—previously referred to in these columns—show that wheat, maize, linseed, cotton and fruit can all be grown in what is theoretically a dry zone, by means of scientific methods adapted to local conditions of soil and climate. Tobacco has now to be added to the foregoing list, and it is expected that the cultivation of this plant on an extensive scale will eventually develop into an important industry

and become a valuable source of revenue to the railway.

Energetic efforts are also being made by the Government to increase the cultivation of tobacco in the Province of Entre Rios, and arrangements are in hand for the establishment of an experimental station at Paraná, under the direction of a representative of the Ministry of Agriculture.

Increase in Commercial Aerial Activities

According to statistics which have just been issued, the year 1936 showed a considerable increase in the operation of commercial air lines in Argentina, 659,846 miles having been flown, and 8,678 passengers carried, as compared with 524,724 miles flown, and 6,561 passengers carried in 1935. Mails carried by air in 1936 totalled 117,891 pounds, and parcels totalled 71,947 pounds, as compared with 79,341 pounds, and 35,190 pounds, respectively, in 1935.

Institution of Mechanical Engineers: (River Plate Branch)

A meeting of the above branch was held in Buenos Aires on July 5, at which Mr. R. J. Musto, A.M.I.E.E., A.M.I.Mech.E., of the Quasi-Arc Co. Ltd., London, read an interesting paper on "The use of electric welding as applied to the renewal of points and crossings, the strengthening of metal railway bridges and to locomotives and boilers," the advantages claimed for this process over other methods being demonstrated by means of cinematograph films. Mr. W. C. R. Livesey, the Chairman of the branch, presided, and the meeting was attended by representatives of the Institutions of Civil, Electrical, Locomotive, and Railway Signal Engineers, in addition to members of the Institution of Mechanical Engineers.

Engineering and Transport Meetings

At a students' meeting of the Buenos Aires Association of the Institution of Civil Engineers, held on July 28, three short papers were read by students belonging to the B.A.G.S.R.: Messrs. G. C. L. Burton, on "The Stringlining of Curves"; D. H. Campbell, on "The Thermit Welding of Rails"; and J. S. Hutton on "The Equipment of Gangs with Motor Transport units on the B.A.G.S.R." Mr. M. F. Ryan, General Manager, B.A. & Pacific Railway, Chairman for the current session, who presided, asked those present to stand for a minute in respect to the memory of Dr. H. H. Jeffcott (Secretary of the Institution), the Marchese Marconi, and Mr. G. T. Leithead, Central Argentine Railway, members who had recently passed away.

In response to an invitation from the committee of the Argentine and River Plate Centre of the Institute of Transport, Mr. Ryan kindly consented to repeat his lecture entitled "From the Cape to Cairo by Air" (previously mentioned in these columns).

VICTORIA

Rewarding the Fertile Brain

As a further incentive in its scheme to encourage employees to send in suggestions for increasing the efficiency of the undertaking, the Betterment and Publicity Board of the Victorian Government Railways offers monetary awards for acceptable ideas. Since the inception of the plan, 35,793 suggestions have been received by the board, of which number 5,992, or approximately one in six, have been adopted. If a proposer desires to take out patent rights in respect of an invention, provided it is recommended by the board for adoption, he will, subject to certain stipulations, be entitled to receive assistance from the Commissioners. It is pointed out by the board that the greatest industry in the State is the railway, in which there are 600 different occupations, each with its problems, and all, possibly, open to improvement in some particular feature.

FRANCE

Railway Traffic Receipts Increase

Substantial gains continue to be shown by French railways traffic receipts. Due to higher fares and goods tariffs, the increase in recent weeks has been very marked. During the 31st week of the year, July 30 to August 5, the passenger receipts were fr. 114,191,000 against fr. 86,380,000 for the same week last year, an increase of 32·19 per cent. Goods receipts for the week were fr. 176,310,000 against fr. 137,455,000, an increase of 28·26 per cent.

Total receipts in thousands of francs for the week on the different systems compare as follow:—

	1937	1936	Increase per cent.
Alsace-Lorraine ...	18,800	12,947,	45·29
Est	38,206	29,873	27·89
Etat	48,233	37,414	28·97
Nord	44,500	32,125	38·52
P.O.-Midi	54,292	45,916	18·00
P.L.M.	86,470	65,560	31·90
Total	290,501	223,835	29·73

U.S.S.R. Locomotives at Paris Exhibition

Soviet Russia is represented at the railway section of the Paris Exhibition by two powerful locomotives of the latest types, one for passenger and the other for goods traffic. They were shipped from Leningrad to Havre, whence they went by rail to the Invalides station in Paris, as the wheels had been adjusted to the standard gauge; their exceptionally large proportions attract general attention. The passenger engine is of the "J.S." (Joseph Stalin) 2-8-4 type having 6-ft. 9¼-in. coupled wheels, now standard on the U.S.S.R. railways. The first locomotive of the series was built at the Kolomna works in 1933. The main parts of the passenger and goods locomotives, including the boiler, cylinders, and motion, are standardised and interchangeable.

The goods locomotive is of the "F.D." (Felix Dzerjinski) 2-10-2 standard type used for hauling trains of up to 3,000 m. tons. The first engine of this series was built at the Vorochilovgrad works in 1931, and has coupled wheels 4 ft. 11 in. in diameter. Other leading particulars common to both "J.S." and "F.D." types are:—

Total heating surface ...	3,158 sq. ft.
Grate area	75·75 sq. ft.
Boiler working pressure ...	220 lb. per sq. in.
Weight of engine and tender in working order, including 44 m. tons of water and 20 m. tons of coal ...	240 m. tons.

Further Rise in Paris Metro Fares

Drastic action has been taken by the Government to reduce the deficit of the Paris Metro and bus systems. A recent Decree compelled the local authority to raise the fares within five days in order to cover three-fourths of the deficit. The rise is applicable in two stages, the first two-thirds of the increase coming into force immediately, and the other third on January 1, 1938. The period of five days was extended to allow the first increase to be made on August 9, so that there might be sufficient time to prepare the new tickets.

Early in June the Metro second class single fare, which is a flat rate available for any distance on the system, was raised by 10 centimes, to 80 centimes; and the first class by 15 centimes, to fr. 1.30 c. The increase on August 9 adds 20 centimes to each. Accordingly, the new single fares are fr. 1.50 c. first class, and fr. 1 second class. Return fares are fr. 2.20 c. and fr. 1.25 c. respectively, the return tickets being issued only before 9 a.m. Collective tickets for school children now cost 20 centimes instead of 10 centimes. On January 1, 1938, another 10 centimes will be added to the price of Metro tickets.

Bus and Taxi Fares also Raised

Bus and taxi fares have also been raised. Passengers on Paris buses generally use books of twenty tickets bought in advance from the bus conductors. The price of the twenty tickets has hitherto been fr. 6, this making each ticket worth 30 centimes. The rise, which is the first on the bus system, brings the cost of each book of twenty tickets up to fr. 8, or 40 centimes a ticket. Single tickets, bought from the conductor to pay fares, cost 55 centimes, so that there is a saving of 15 centimes a ticket in buying the twenty tickets in advance. The number of tickets to be handed over for each section of the journey remains unchanged. There will be a further increase of 5 centimes a ticket in bus fares on January 1, 1938. The new taxi tariff in force from August 9 is increased by 25 per cent. This rise in fares is not popular with the taxi-drivers' union, which would prefer a better organisation of the transport in the city, and more cab-ranks.

STABILITY OF RAILWAY VEHICLES

Methods and apparatus used by French railways in the investigation of track and riding problems

QUANTITATIVE measurement of the forces exerted on rails and of the relative movements between coach bodies, bogies and track, have assumed greatly increased importance in relation to the comfort of passengers and safety at high speeds. A full range of apparatus* is now available for the examination of the problems involved, and investigations are being conducted by the French railways in accordance with an agreed programme which includes not only the examination of new vehicles but also the study of old material with a view to its improvement. Much skill and judgment is required in the use of the apparatus and in the interpretation of data, but practical results have already accrued and will become more numerous and important as the volume of correlated information increases.

Apparatus used in the investigation of the stability, suspension and comfort of vehicles may be classified in three main categories: (1) Devices for measuring the relative displacement between parts of a vehicle or train. (2) Devices for the measurement of the horizontal and vertical forces of an axle, determining safety. (3) Apparatus providing a measure of the comfortable riding of a vehicle. In all cases, it is desirable that the measurements be quantitative and on an absolute basis, permitting comparisons to be made between the results of tests on different rolling stock and different railways. Piezo-electric devices are specially useful in this respect.

Measurement of Movement

The first investigations, undertaken about ten years ago, were to determine the trajectory of an axle with reference to the track. Balls of clay were placed along the rails, and the wheel flanges left in the clay the marks of their passage. By this simple method it was established that an axle oscillates regularly about the axis of the track, and that the axles of a given vehicle have a fixed trajectory with regard to the rails. The apparatus now used to obtain a continuous record of these displacements consists of a small roller carried by the vehicle and held hard against the rail by a spring, with a measuring cable, running over pulleys fixed to the body of the vehicle, attached at one end to the roller, and at the other to the stylus of a recorder. Alternatively, a Bowden wire is used. The recording strip is driven electrically or by mechanical gearing from the axle.

Similar apparatus is used to measure relative movement between parts of the vehicle, *e.g.*, horizontal and vertical movement between the undercarriage and the bogies, the angle between the axes of the bogie and the vehicle, the deflection of the springs, and so on. Another method of determining relative displacement consists in applying the movement of the part under examination to a rheostat in a constant voltage circuit; the variations in current are recorded by an oscillograph and constitute a measure of the movements investigated. In all cases, the apparatus is completed by a device marking distances on the recorder strip.

Measurement of Force

The apparatus described above is essentially suitable for research purposes, including detailed investigation of the motion of a vehicle and determination of the modifications likely to improve it. To assess the advantages gained, or for the purposes of acceptance trials, it is necessary to measure the effects of these movements on the track and on passengers.

The stability of a vehicle depends upon the vertical and horizontal forces between wheels and rails. The first method used to measure these forces consisted in measuring the displacement of the rails, and calculating the corresponding forces from a knowledge of the resistance of the track to deformation. A block of steel, fixed to the rail and connected to a recorder by amplifying levers, provided the requisite information. This apparatus is still used but it measures only the forces at one point. For a full consideration of the problem, a continuous record is needed and this requires the use of apparatus free from inertia and capable of measuring forces which may act only for some hundredths of a second. Also, the apparatus must not introduce any elasticity capable of modifying the forces under examination. Piezo-electric quartz-crystals meet these requirements. The vertical and horizontal forces between coach frame and axle being practically equal to the forces between wheel and rail, it is arranged that the frame rests on quartz crystals, which supply quantities of electricity proportional to the mechanical pressure applied to their faces. The electricity thus obtained charges a condenser and so establishes a difference of potential which is amplified by thermionic valves and recorded by an oscillograph. The quantities of electricity generated by the quartz are very small, hence the crystals and the first stage of amplification must be mounted in a perfectly dry casing to avoid leakage-errors.

Measurement of Comfort

A quantitative measurement of the degree of comfort, as dependent upon smooth riding or freedom from shocks, can be obtained by recording the acceleration to which passengers are subjected. The first apparatus of this type was the Hallade equipment, consisting essentially of pendulums free to swing in different directions. This apparatus permits comparisons to be made between two vehicles or two sections of track, but the movements depend on the displacement, acceleration and periodicity. Freedom from elasticity and inertia effects is however again obtained by means of piezo-electric quartz crystals in an apparatus the operating mass of which is applied firmly to the quartz by springs. The electrical impulses, produced by the variations in contact pressure due to acceleration, are amplified and recorded as already explained. The forces operative on the quartz being now of the order of pounds instead of tons, three stages of amplification are required instead of the two which suffice in apparatus for measuring forces between the coach body and bogies.

* Described in the staff organ of the French State Railways, *L'Etat Notre Réseau*, January, 1937, from which we have extracted the details in this article.

BRIDGE RENEWALS ON LONDON-MANCHESTER ROUTE, L.M.S.R.

Work is to begin shortly on a £23,000 scheme for reconstructing two large bridges on the Derby-Manchester main line of the L.M.S.R., in order that bigger engines may be used. One is situated immediately south of Chapel-en-le-Frith station, and the other between the north and south junctions at Chinley. Both were built about 1865 and consist of wrought-iron arched girders, subsequently strengthened. The new structures, which will have steel main girders, cross girders, and concrete floors, will be erected on staging alongside the existing bridges, and on the days of changeover will be rolled bodily into position. The whole of the work is expected to be finished by May, 1938.

GENERAL HAMMOND'S REPORT ON THE CHINESE RAILWAYS

A review of each branch of railway working in China, with comments and recommendations for its reorganisation within the scope of a general regrouping of lines and reorganisation of the whole administration from the Ministry of Railways downwards

As recorded in THE RAILWAY GAZETTE of March 22, 1935, Brig.-Gen. F. D. Hammond, a recognised authority on overseas railway organisation, was invited by the National Government of the Republic of China to visit that country and, at his request, was permitted to take with him two experts, Messrs. L. T. Lean and J. F. M. Taylor to assist him. He was requested to investigate the existing conditions of the railways, and recommend what reforms he considered necessary to secure greater efficiency in operation, and thus improve China's credit both abroad and at home. It should, however, be remembered that, as previously recorded in these pages, certain measures had already been taken for the rehabilitation of China's railways prior to General Hammond's visit, but it was his report in recommending the adoption of similar and further measures, together with its dispassionate survey of the actual condition of the various lines, that strengthened the hands of the Ministry and the administrations in their decisions to carry through many reforms.

General Hammond presented his report in September, 1935. It was intended solely for the information of the National Government, but in view of the general interest it aroused, the Government recently decided to print and publish it. The interval between its preparation and publication makes it desirable to adopt the past tense in reviewing the conditions it describes. In order to give a complete survey of the National Railways system as a whole, as opposed to a disconnected series of pictures of the different lines, the report began by discussing the various branches of railway working in China, rather than the individual railways severally, and it dealt first with the engineering branch.

Engineering and Locomotive Running

The primary requirement under this heading was the improvement of the sleepers on all railways, and in this connection General Hammond recommended the establishment of a creosote treating plant for impregnating Oregon pine sleepers, preferably owned and worked by the mines that produce the creosote. A plant to treat at least 1,500,000 sleepers a year was considered necessary, but once the plant was purchased, the only money that would go out of the country would be for the untreated sleepers. Other comments were that larger permanent way gangs should be employed with longer lengths of line, and that the wholesale bridge renewals then in hand on some lines that were already carrying all the traffic offering, were financially unjustifiable. Instead, consideration might be given to the use of Garratt-type locomotives, which would obviate the necessity for relaying with heavier rails and the strengthening of all bridges except those with longer spans. The Garratt was, stated the report, a " well proved type " and " much superior " to the Mallet.

The departmental system of organisation and operation was in force on all Chinese lines, and a general shortage of locomotives existed, a condition accentuated by their insufficient use, and by the length of time they spent under repair. Longer engine runs and double-crewing or pooling were recommended. Due to lack of appreciation by the Traffic Department of the importance of getting the maximum work out of engines, and want of co-ordination between Locomotive and Traffic Departments, an engine then spent on an average, half the time it was in steam at a standstill, usually waiting for traffic orders. To reduce the heavy coal consumption, rationing was recommended as the bonus system was difficult with pooling. Emphasis was laid in the report on the necessity for the early return of statistics to enable officers of all departments to keep an adequate check on expenditure.

Locomotive, C. & W. Workshops

No branch was in greater need of improvement and modernisation than the workshops, of which there was then one for every 220 miles of line, in addition to some sheds which carried out general repairs. Heavy repairs, including the changing of boilers, took from two to three, instead of only one month. Planning and costing were strongly recommended. The workshops were often small and badly laid out, and incapable of extension, with the result that overhead costs were out of all proportion to the work executed. The first step required was the formation, under the Ministry, of a central workshops organisation to decide what shops should be closed, and to draw up a scheme for, say two workshops initially, to be taken over by this organisation from the railways.* Subsequently others would, the report anticipated, be similarly selected until all that were to be retained came under the Ministry for management by the central workshops organisation. As the shops were taken over by the Ministry, they would be staffed with up-to-date planning and costing branches, and the full cost of repairs, including the proportion of the headquarters organisation at the Ministry, were to be worked out.

Traffic, Operating, and Commercial

Though there was vehicle or train control, or both, on many of the main lines, the results obtained were far from uniform, and General Hammond considered that the Ministry did not take to task those responsible for bad results. Uniformity in the system of control and stricter supervision were advised, to secure improved efficiency and punctuality. Train and station staff, and traffic inspectors were excessive, especially when there was train control, and should, it was stated, be reduced. The defects of the departmental system led General Hammond to recommend the introduction of the divisional system, with all operation, both locomotive and traffic, controlled by a superintendent of the line, having district superintendents under him. Simultaneously, separate commercial and workshops departments were to be brought into being. To enable them to be fitted for appointment as district superintendents, locomotive officers should undergo a course of six months' operating training; traffic officers selected as district superintendents, having no technical experience, would have locomotive officers as their assistant superintendents.

* In our issues of April 23 and April 30, we reported, in our Overseas columns, the inauguration of a central workshops organisation and a scheme for the concentration of repair work such as General Hammond recommended

General Hammond found that the rates classification was uniform on all Chinese railways, and was arranged under six heads; special rates were applied in the case of a few commodities, mostly coal and agricultural produce. Additional surcharges—applied to the Ministry's purposes*—were also levied on most lines to the tune of from 15 to 20 per cent., but these were not usually included in the accounts of individual railways. A further 10 per cent. was charged for railway risk on all but certain articles (carried at special rates) for the loss or damage of which the railway assumed responsibility. He considered that the rates structure did not sufficiently encourage long hauls, and he emphasised that the cardinal aim of the Ministry should be to insure that rates be fixed for all railways according to what the traffic would bear. A staff of enterprising officers should, he suggested, be appointed to work under the Director of the Commercial Department to get in touch with the commercial community and frame a revised rate structure accordingly. No attempt should be made to standardise rates for all lines, as conditions of competition and other considerations varied considerably in different areas, but more use should be made of special rates. In Great Britain and the U.S.A., stated the report, 75 per cent. of the total tonnage was hauled under special rates. For Chinese conditions "zone rates"—fixed uniform rates from all stations in a certain zone to a trade centre or port—were recommended as eminently suitable. Spheres of influence of the various railways relative to seaports and manufacturing centres would have to be studied, but in this matter General Hammond did not consider that he was in a position to make detailed recommendations. Standard charges for loading and unloading were desirable and should be based on average costs, but merchants should be allowed to do their own handling if they wished to do so. Generally speaking, it was considered that the development of the interior and the prosperity of the country as a whole could not be attained unless rates were lowered, even though this might entail a temporary loss of revenue.

Fares, Stores, Accounts, and Road Competition

In China 87 per cent. of the passenger revenue was derived from third class fares (or in the few instances where there was also a fourth class, from third and fourth class), but the existing third class fare was, General Hammond decided, too high to permit of the bulk of the population using the railway; fares should therefore be reduced until they were proportional to the average daily wage. Almost everywhere else in the world, reductions in fares had, he pointed out, brought increased revenue, and the basic reduction recommended for third class was from 1.76 cents to 1.00 cent per km., but this reduction would have to be carried out gradually in two or more stages. The fourth class should then be abolished.

Total stores balances when General Hammond was in China were valued at $34·5 million, and, he considered, should be reduced to $20 million, exclusive of stores for large construction works. A unified central stores organisation, in place of the 13 authorities then existing, was deemed essential, and this would fit in with the proposed central workshops organisation. At the time the report was written, stocks of departmental stores were in some cases absurdly high, and should, it stated, be carefully watched.

No comment was made upon the system of accounts, which was based on the American model. A statistics branch should, however, be formed under every chief (railway) accountant.

* Used as security for loans from the British Boxer Indemnity Fund

Road competition was, the report pointed out, still in its infancy in China, and if prompt action were taken there would be time to combat it. The first move recommended was the institution of the 1-cent third class fare. The low rates on some of the lines (notably the Nanking—Shanghai) and the collection and delivery in the larger towns were all to the good, but the only real remedy lay in the Government regulation of buses and lorries, so as to make road traffic an adjunct to, and not a competitor with, the railways. To this end, licensing commissions for passengers and goods in every Province were advocated, the issue of licences to depend upon the adequate insurance of passengers and freight, reliability of vehicles, and the fact that adequate transport facilities did not already exist; the commissions would also stipulate specified routes for buses, and localities of operation for lorries, and the publication of rates or fares approved by the commission. Penalties for the contravention of these regulations and for excessive hours of drivers on the road should be heavy.

Other recommendations in this connection were that though no action should be taken to check road construction, an attempt should be made to co-ordinate the different forms of transport especially where railways were actually established, so that capital and effort could be devoted to the best advantage of the country as a whole. The road construction programmes of the Provincial Governments should be referred to the Ministry of Railways, and loans and grants from the Central Government for Provincial roads should be approved by that authority.

Staff and Reorganisation

Retrenchment of staff, which was essential, must be effected gradually for social and political reasons.

The form of reorganisation most needed was, the reporter considered, the unification of all the National Railways with a strong central control and a general loyalty to the unified National system as a whole. Methods of operation, maintenance, and repairs, limitation of stores balances, and the seeking out of ways and means for attracting traffic were all matters that required the closest scrutiny of the Ministry in exercising that control.

The organisation recommended consisted of four areas, or groups, each with an Area General Manager, Chief Accountant, Chief Cashier, Staff Assistant, Superintendent of the Line, Traffic Agent, and Chief Engineer. These areas were:—

	km.
South-Western (Headquarters, Canton)—	
All sections of the Canton-Hankow line	1,239
Canton-Kowloon Railway	143
	1,382
South-Eastern (Headquarters, Shanghai)—	
Nanking-Shanghai Railway	328
Shanghai-Hangchow-Ningpo Railway	290
Soochow-Kashing chord line	78
Kiukiang-Nanchang	128
	824
Central (Headquarters, Pukow)—	
Lung-Hai Railway	1,083
Singsiang-Hankow	599
Tsinanfu to Pukow	720
	2,402
Northern (Headquarters, Tientsin)—	
Peiping-Suiyuan Railway	877
Peiping-Liaoning Railway	457
Tientsin to Tsinanfu	352
Kiaochow-Tsinan Railway	456
Peiping to Sinsiang	738
Taokow-Chinhua Railway	166
Cheng-Tai Railway	298
	3,344

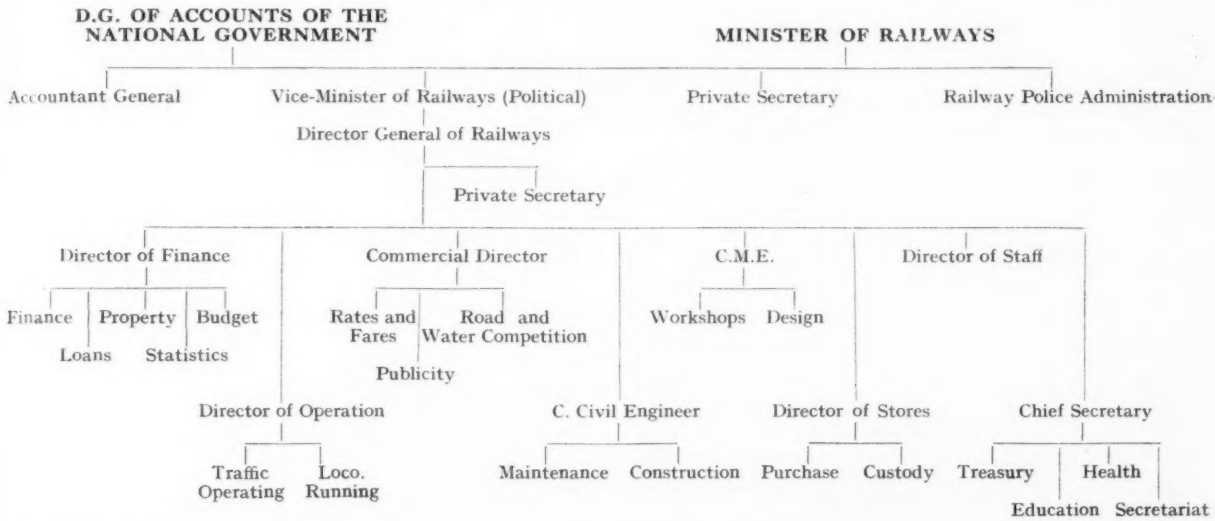
A second distribution was also proposed, but was not so strongly recommended.

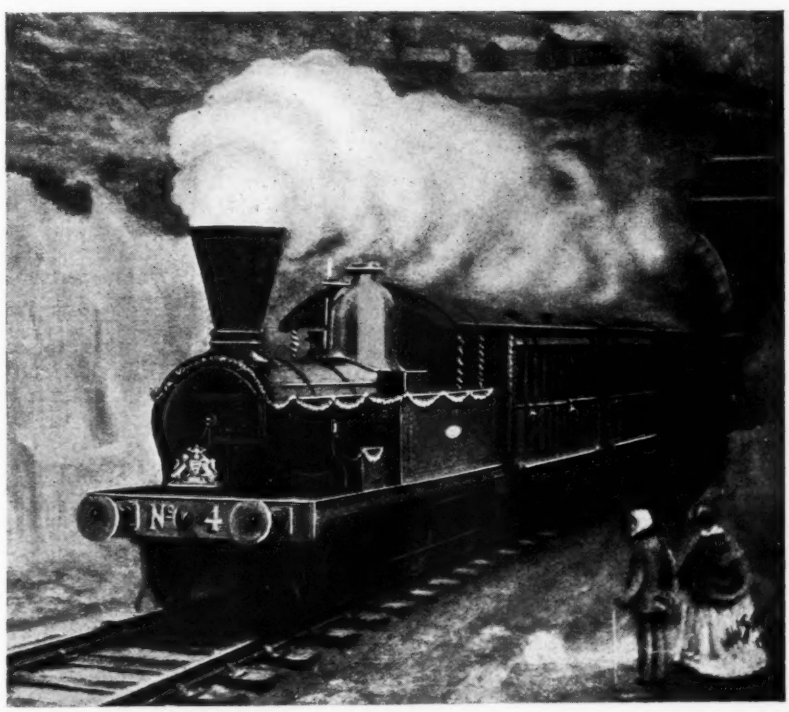
The posts of Area General Manager should, it was suggested, be filled by selection from the managing directors of the existing lines, but their salaries and those of their principal officers should be higher than the corresponding salaries on the various individual railways. The report also issued a warning that, in place of the prevailing idea that Chinese railways were purely public institutions, should be substituted the principle that they must be commercial undertakings.

The Ministry

The Engineering Department of the Ministry had as its head a Civil Engineer, who controlled not only civil, but also mechanical engineering, planning and construction work, and he also advised on the technical side of locomotive running. In a revised scheme suggested in the report, the mechanical side was controlled by a separate chief officer. The complete organisation recommended for the Ministry was as shown in the chart below.

It will be noted that the Executive Vice-Minister was, in this scheme, replaced by a Director-General of Railways, that the various departments and commissions were grouped into a more coherent whole, that the Traffic and Operating Department was, like the Engineering Department, divided into its two main constituents, and that the Central Stores Department was included with other suggested reforms, all of which, if adopted, should greatly benefit the Ministry and whole National Railways system.





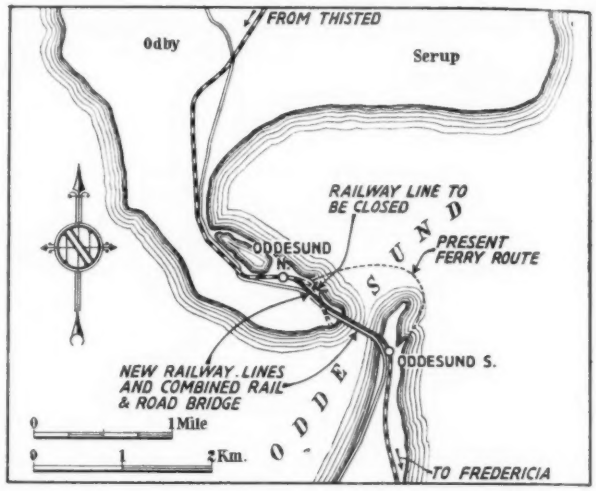
A reproduction of an effective oil painting by Mr. W. W. Stewart, one of our readers in New Zealand. It depicts the first Royal train to run in New Zealand, which conveyed the Duke of Edinburgh from Lyttelton to Christchurch on April 23, 1869. *This painting was recently reproduced in colour on the cover of the "New Zealand Railways Magazine"*

THE ODDESUND BRIDGE, DENMARK

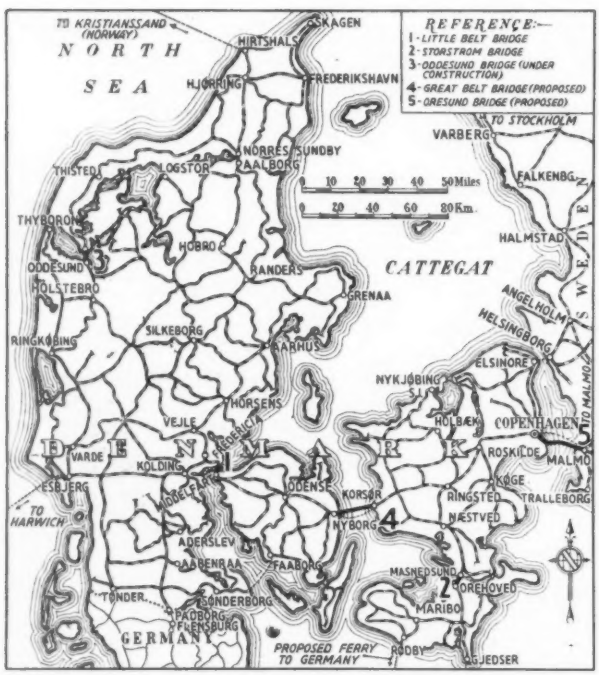
Another important Danish bridge, in the construction of which an interesting form of pile foundations has been used

AS is perhaps natural from its geographical position and surroundings, Denmark is one of the greatest bridge-building centres at the present time. On May 15, 1935, the Little Belt bridge was opened to traffic, and the Storstrøm bridge, one of the longest bridges in Europe, is to be opened on September 26. A third bridge, now under construction, is over the Oddesund. Though overshadowed by the two larger structures, this work offers several special features of interest from a constructional point of view.

As early as in 1921 the first plans for a bridge across the Oddesund were prepared, but nothing happened in the following ten years, and it was not until April, 1932, that a law covering the construction of both the Storstrøm and the Oddesund bridges was passed in the Danish Rigsdag. At present the traffic to and from the north-western part of Jutland is carried by a train ferry crossing the Oddesund narrows, which was opened in 1883. The ferry also carries motorcars, of which some 14,500 pass in a year: the railway traffic amounted to about 100,000 passengers and 47,000 axles.



Sketch plan of site of new bridge and its approaches



Sketch map of Denmark showing the position of this bridge at "3"; "1" and "2" are the sites of the Little Belt and Storstrøm bridges

The bridge is being built to State Railways' design, and the contract for the substructure is in the hands of two Danish firms, Kampmann, Kjerulff & Saxild and Monberg & Thorsen, both of Copenhagen, while the superstructure is being supplied by the Danish firm Allerups nye Maskinfabrik, of Odense. The total cost of the bridge, the realignments, and road connections is expected to be about Kr. 6,000,000, say £268,000.

Site and Design of the Bridge

The bridge alignment crosses the sound at practically the narrowest width, as may be seen from the accompanying site plan. The station shown on the south shore will be closed and that on the north shore will be rebuilt. The principal constructional difficulty arose from the fact that the subsoil consists of a thick layer of clay, sand, mud and organic matter, offering so little resistance and stability that no permanent structure can be founded thereon. The layers under this are also very heterogeneous, so that it was impossible beforehand to say to what depth piles must be driven to secure stability.

The current is very strong and changes direction at irregular intervals, and ice blockage has to be reckoned

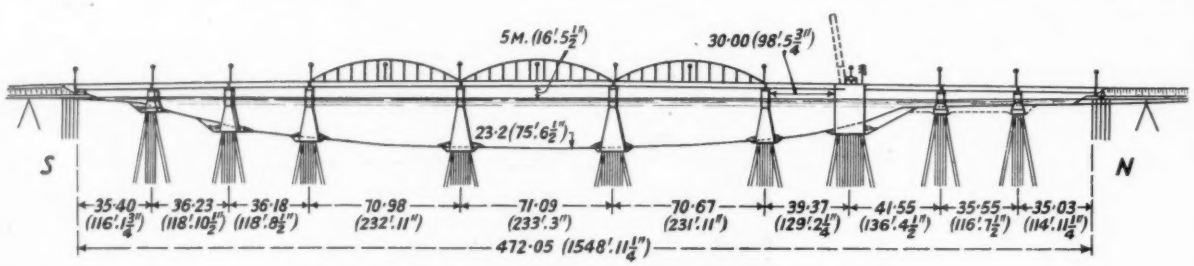
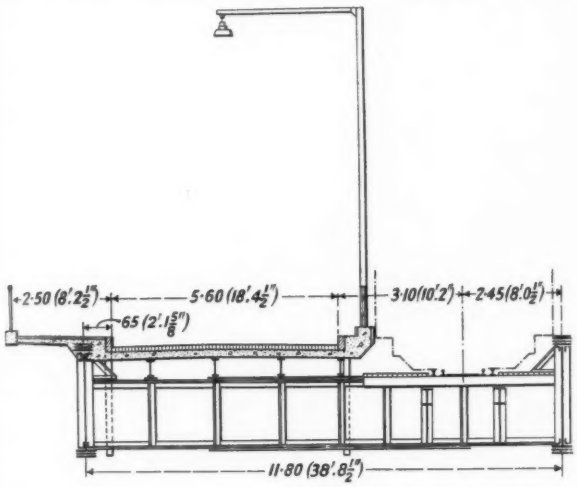


Diagram of cross section of Oddesund and side elevation of bridge

with during the winter. Navigation through the sound necessitates a bascule span giving a free passage of 30·0 m. (98·4 ft.). The bascule span is in the northern half of the bridge, as observation has shown that most ships use that channel. The height of the bridge above water is about 5·0 m. (16·4 ft.). The lengths of spans and other leading dimensions may be seen from the side elevation of the bridge and the cross section of the sound. The bridge has seven 35-m. to 42-m. (115-ft. to 138 ft.) plate girder approach spans, one of which is the bascule span, and three central spans with bowstring stiffening of about



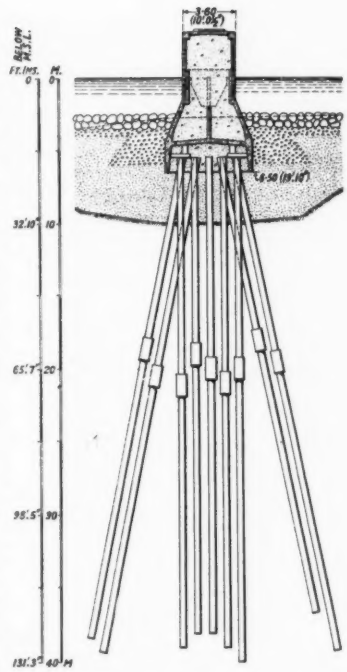
Cross section of approach span showing (left to right) footway, roadway and railway

71 m. (233 ft.) each. The main plate girders are 2·7 m. (8·8 ft.) in depth in both approach and stiffened spans, and the cross girders are 11·8 m. (38·7 ft.) in length. The bridge will carry a 5·6-m. (18·4 ft.) wide roadway with a 2·5-m. (8·2 ft.) wide sidewalk for bicycles and pedestrians, and a single railway track. The material used is British steel with a yield-point of 2,600 kg. per sq. cm. (16½ tons per sq. in.). Altogether about 3,200 tons (metric) will be used in the superstructure.

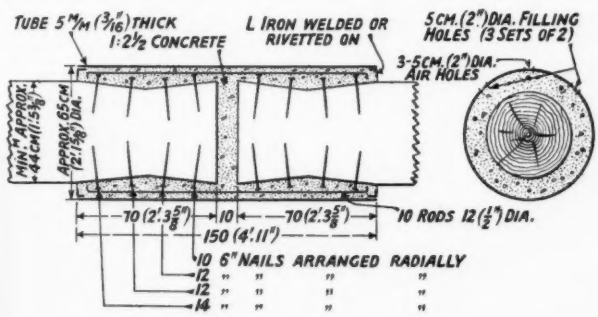
Half of one of the timber piles with steel and concrete sleeve being fitted for jointing to other half

Pier Construction

The most notable feature of the bridge is the foundations. The piers consist of caissons, founded on wooden piles of 48 cm. (1·58 ft.) average diameter. Owing to the poorness of the subsoil some of the piles had to be driven to 45 m. (148 ft.), the greatest depth to which a pile has ever been driven in Denmark. As it was impossible to get piles of the necessary length—up to 35 m. (115 ft.)—in the country, it was decided to make up the piles in two parts, which were connected by a sleeve joint shown in the illustration below. In each joint a steel tube covers the ends of the two parts of the pile, and about 100 6-in. nails are hammered partly into the two pile pieces, which are specially shaped, as the section shows, to form a locking joint, the space being filled with concrete. It has been found that the piles so formed have the same strength as if they were in one length. The piles are driven by a floating steam piledriver which has a very long and strong guide-frame for steering the pile. To be able to continue the ramming under water a pile extension of steel or oak is inserted between the pile and the hammer. All the piles



Cross section of pier founded upon sleeve-jointed wooden piles



Details of sleeve joint for wooden pile

are driven with a batter except four or six under each pier, which are cut to exact level to serve as temporary support for the caisson, when this is placed in its final position.

The caissons are of reinforced concrete and were built on the shore. The caisson for the bascule span is 26 m. × 14 m. (86 ft. × 46 ft.) and 16 m. (53 ft.) in height. For piers Nos. 4 and 5 they are 24 m. × 11 m. (79 ft. × 36 ft.) and 25 m. (82 ft.) high. The caissons are launched from a slipway and floated to the pier site, where they are placed on the group of piles previously driven. The hollow cells in the caisson are next filled with concrete, and the water is then pumped out of the working chamber, which is filled with compressed air. The sides of the piers

are faced with granite. A cross section of a pier and its piles is shown in one of our illustrations. Round the piers the channel bottom is dredged out and replaced with sand, which serves the double purpose of steering the piles during driving, and of supporting the concrete in the working chamber during the concreting of the pier, and further it forms a bed for the stone pitching round the pier.

The Superstructure

The erection of the superstructure is now in hand. The track is on timber, carried by two rolled-beam stringers supported by the cross girders. The roadway and the footway are supported by reinforced concrete slabs, carried by longitudinal rolled beams resting on the cross girders. The wearing surface on the roadway is a 12-cm. (4·7-in.) reinforced concrete slab, and on the footway a 3-cm. (1·2-in.) layer of asphalt. Between the track and the roadway there is a reinforced concrete rib, in which a solid railing is fixed. (See cross section on p. 395.) The bascule span has a counterweight, which is placed in the large bascule pier. The track construction in this span is the same as on the other spans, but the roadway consists of 13-cm. (5·1-in.) thick oak planks covered with a wearing surface of impregnated hemp ropes in a thin layer of asphalt.

The bridge, the station rebuilding and also the road connections are expected to be completed in the early spring of 1938. As the State Railways expect that the building of the bridge will make the road competition much more acute, they declared that they would not be able to bear any considerable part of the cost of the bridge. It has therefore been decided that the railways shall bear only one-third of the total cost, while the rest has to be borne by the local authorities, which in turn receive part of the cost from the road fund. When the bridge has been completed, it will be possible to save about half-an-hour in journey time.

IMPROVED TRAWLER BUNKERING FACILITIES AT FLEETWOOD

The L.M.S.R. modernisation scheme at these docks includes the installation of six high-capacity coaling plants

As part of an £85,000 scheme of modernisation at its docks at Fleetwood (Lancs.), involving the electrification of the machinery in use there, the London Midland & Scottish Railway has recently provided entirely new facilities for the rapid coaling of steam trawlers at this important West Coast port. These facilities comprise the installation of a series of six independent electrically-operated coaling plants, with an individual capacity of 200 tons an hour, and specially adapted for dealing with fishing vessels. The new equipment, which replaces coaling either by steam cranes and buckets, hand loaded from railway wagons, or by three electrically-driven transporter cranes, with buckets also filled by hand direct from railway wagons, has been supplied to the specification of Mr. W. A. Stanier, the L.M.S.R. company's Chief Mechanical Engineer, by Mitchell Engineering Limited. Three of these plants serve the Wyre dock and three the Fish dock.

In order to keep the plants adequately supplied with coal, the sidings have been enlarged so that they all have independent accommodation for an average of 30 full and 30 empty wagons, apart from the general and marshalling sidings. The tracks of the full-wagon and empty-wagon sidings for every plant are laid parallel and graded up to the discharge point over a distance of 60 yd. at an average inclination of 1 in 90. The full-wagon road is served by a vertical bollard haulage capstan having the haulage rope permanently attached to the bollard and provided with a return tail rope operating over a weight-applied tension gear.

The capstan is controlled from a cabin adjacent to the wagon tippler, and, in addition, is provided with an automatic, treadle-operated cut-out switch fixed approximately at the top of the incline and so arranged that a wagon in moving on to the trip switch will automatically stop the capstan. In operation, the towing hook of the capstan is attached to the last wagon of a group of—for example—eight full vehicles, all of which have been uncoupled. On starting the capstan, the wagons are moved forward up the incline until the leading one engages the trip switch, thereby stopping the movement. From this point forward the leading wagon is moved on to the platform of the wagon tippler by means of a normal 1-ton capstan. The empty wagon, after discharge, is dealt with by the same capstan but is automatically switched, by means of a spring-operated track switch, to the empty siding, and, this being on the down grade, the wagon is carried by gravity well clear of the crossover.

The coal handling plant consists in the main of a wagon-tippler feeding an inclined belt conveyor, which in turn delivers to a telescopic boom conveyor mounted in a travelling bridge structure; the boom conveyor is provided with a luffing motion and flexible bifurcated chutes for delivering coal to the trawler bunker hatches. The main inclined conveyor is arranged at right angles to the boom conveyor, the whole arrangement making a very compact layout in the space available.

The tippler is of the side-discharge type, arranged for handling all sizes of wagons from 8 to 20 tons; the time required to tip a full wagon and to lower the empty one, is one minute for each operation. The coal delivered by the tippler is received by a " W " form of hopper having an outlet on the inside face of each leg. Coal is extracted from the hopper by a double-acting jigger feeder each side; the capacity of this feeder is controlled by the length of the stroke, and this is adjusted to pass coal at the rate of 200 tons an hour.

The inclined belt conveyor, 30 in. wide, running at a speed of 300 ft. per min., and having a carrying capacity of 200 tons an hour, delivers to the boom conveyor over a large travelling tripper, attached at its upper end to the bridge structure and moving with it; the lower end is supported on flanged wheels running on a track fixed to the main conveyor steelwork.

The travelling bridge structure is carried on four 2-wheeled articulated bogies running on rails at quay level and parallel to the edge of the quay. One bogie on each leg is driven through shafts and gearing from a motor fitted in the machinery-room on the top of the bridge structure. The total travel of the bridge is 40 ft. at a speed of 40 ft. per min. The bridge structure supports in turn the telescopic boom having a motion (to a total of 50 ft.) at right angles to the quay. The range of travel of the bridge in conjunction with the cross-movement of the boom is sufficient to cover the bunker hatches of two trawlers lying abreast, without moving the vessels.

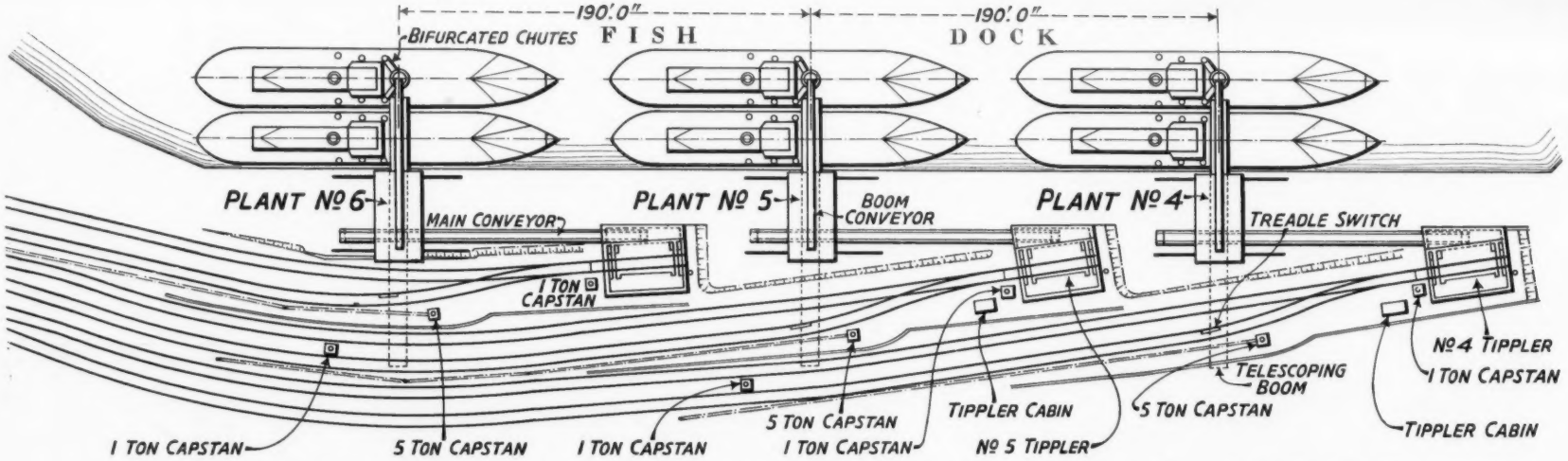
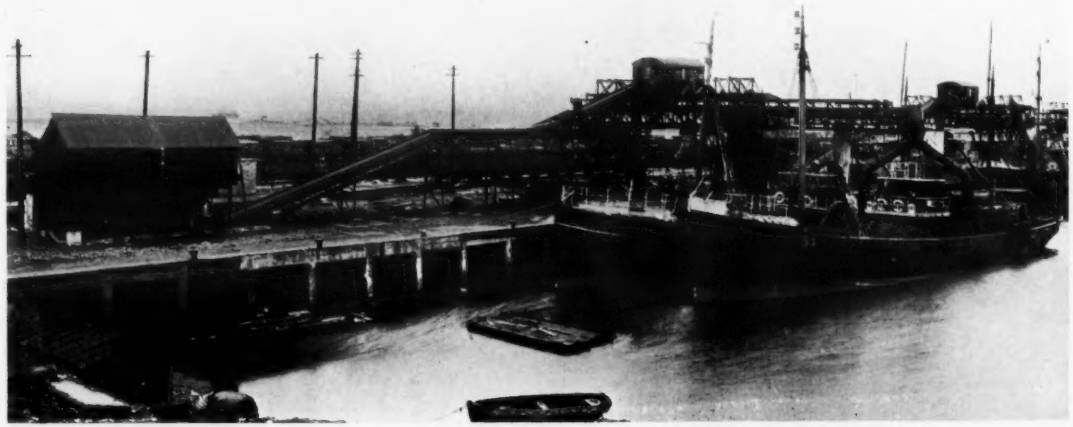
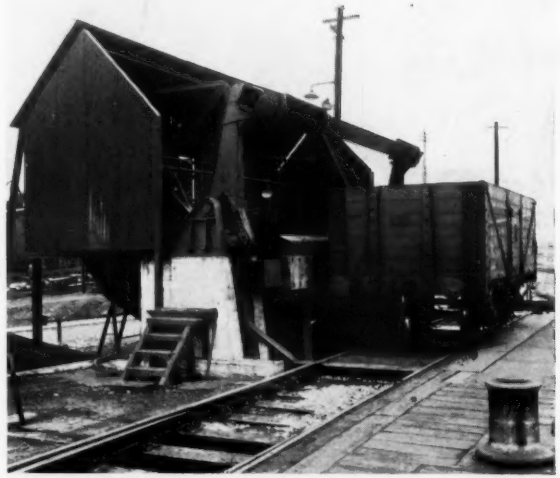


Diagram showing lay-out of railway tracks, electrically operated coaling plants, and other machinery at Fleetwood Docks, L.M.S.R.



General view of trawlers coaling



No. 4 coaling plant. Wagon in tippler

IMPROVED TRAWLER BUNKERING FACILITIES AT FLEETWOOD, L.M.S.R.

(See article on opposite page)

DAY SALOON COACHES FOR MAR DEL PLATA SERVICE, B.A.G.S.R.

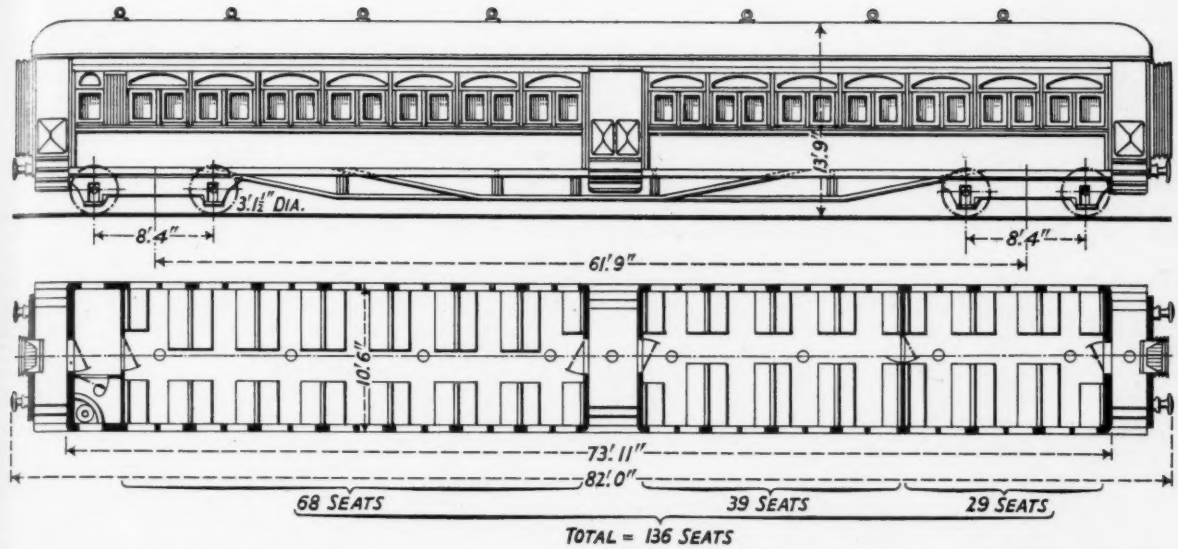
This new type of car has been evolved by converting a second class suburban coach

WITH the object of fostering day (in preference to night) travelling between Buenos Aires and the seaside resort of Mar del Plata, a distance of some 250 miles, the Buenos Ayres Great Southern Railway has recently put into service a new type of first class saloon coach which has been converted from existing second class suburban stock. These coaches, prior to conversion, seated 136 passengers and had entrances in the centre and at both ends; and a small lavatory was also provided. The following works were entailed in their conversion: the remodelling of the shape of the ceiling; applying plywood panels to the sides and end; blocking up the end entrances to provide additional length to the interior of the coach; providing double doors to the centre entrance instead of iron gates; covering the existing floor with a special compound, and laying coloured rubber floor covering over the compound; and providing special seats, mounted in pairs with central armrests on coloured enamelled tubular frames each mounted on a turntable. The upholstery of the seats is of hide in bright shades of green, scarlet, brown and blue. At one end of the car a commodious toilet has been arranged, and an attendant's vestibule with racks for luggage; at the opposite end, lavatory and W.C. compartments have been provided. The capacity of the converted coach is 72 seats.

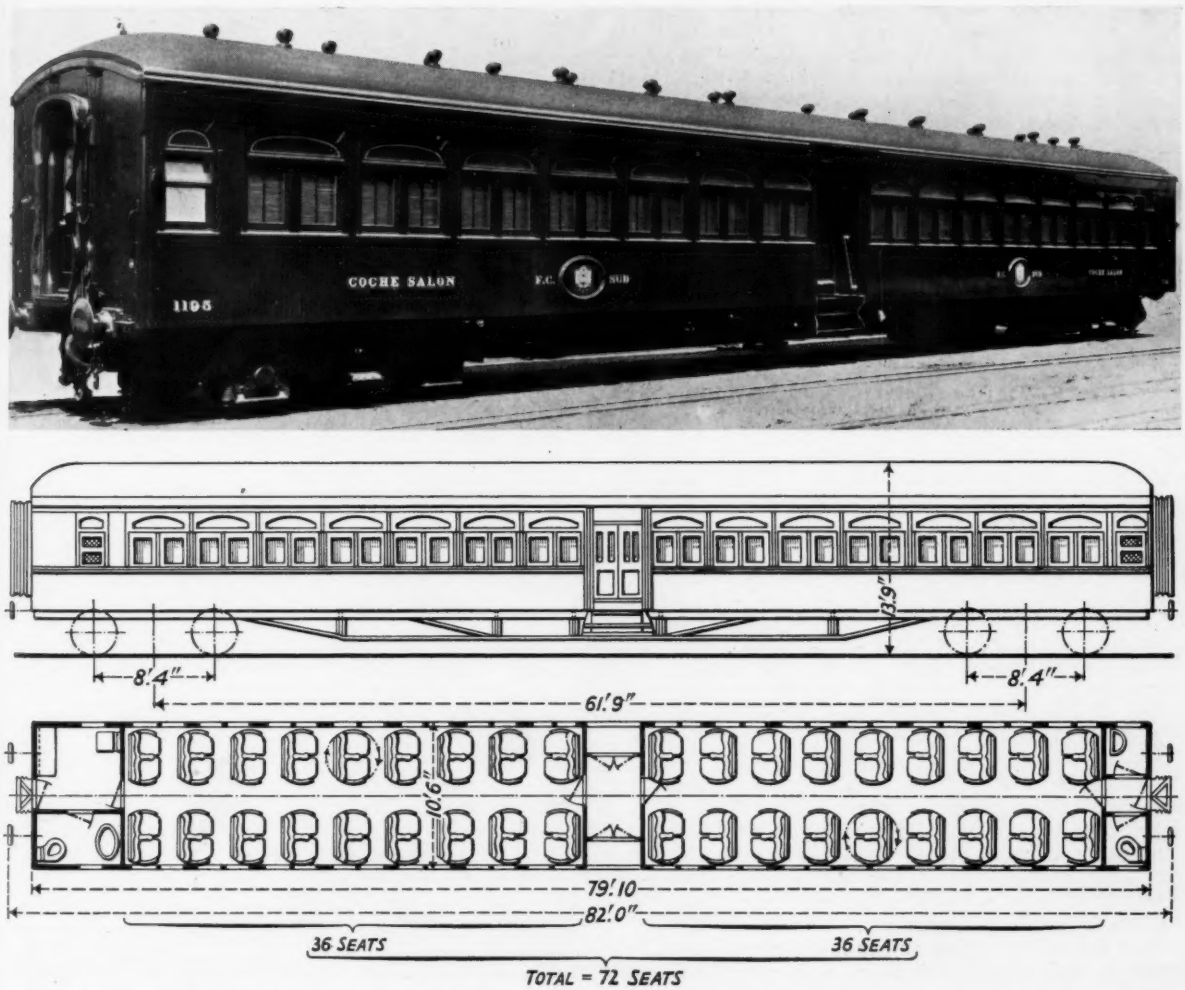
Interior of first class saloon coach as converted from second class suburban car Note the special seats mounted in pairs each on a turntable

Interior of second class suburban coach prior to its conversion as a first class saloon car

In carrying out this conversion, special attention has been paid to lighting and ventilation, the former being provided with opal shades of modern designs, and the latter with circulating fans and extractors of the latest patterns. A bright note is maintained by fitting chromium plated coat hooks and luggage racks. The sides and ends of the interiors are enamelled in light, pastoral colours, to tone with the seats and floor coverings. The ceilings and ventilating fan bases are painted white; and the light brackets are chromium plated. Mirrors are provided at the ends of the passenger saloons and in the lavatories. The seats of these coaches are numbered, and may be reserved without additional charge. The altered internal appearance of one of these cars can be seen from the illustrations on this and the opposite page, and on the latter is also an exterior view of car No. 1195 as it now appears.



Line diagrams of B.A.G.S.R. second class suburban coach—showing the end doors, central gates, and seating—prior to its conversion as a first class saloon coach



Three-quarter view and line diagrams of B.A.G.S.R. second class suburban car as now converted to a first class saloon coach, without end doors and with improved lavatories, central doors vice gates, and altered seating

NEW ARTICULATED LOCOMOTIVES, SOUTHERN PACIFIC RAILWAY

Built by the Baldwin Locomotive Works, these engines operate with the cab in front, and are fitted for burning oil fuel

BY courtesy of the Baldwin Locomotive Works, we illustrate and describe one of a series of new articulated locomotives of the 4-8-8-2 type recently constructed as part of an order for a total of 26 engines of the same class placed by the Southern Pacific Railway. These engines are fitted with four single-expansion cylinders, and are arranged, as the illustration of the complete engine shows, for operating with the cab in front, the tender, which carries oil fuel, being coupled to the smokebox end.

The Southern Pacific was one of the early users of Mallet locomotives, and in 1928 one of them was rebuilt as a single-expansion engine. In the same year, the company ordered 10 single-expansion articulated locomotives of the 4-8-8-2 type from the Baldwin Locomotive Works, and these were followed by 16 locomotives in 1929 and 25 additional in 1930, all practically duplicates of the first lot. The unusual design of these locomotives was developed especially for the Southern Pacific Railway, and the object of placing the cab at the front end is to protect the enginemen from smoke and gases while passing through the many tunnels existing on the lines worked over; moreover, in this position the enginemen obtain a better view while traversing curves in the mountain passes and tunnels.

The earlier locomotives of this type were designed primarily for service on a section of line 140 miles in length, with an ascending ruling grade in the eastern direction of 2·5 per cent., and westward of 2·3 per cent. They soon proved highly successful, not only in freight service but also for hauling passenger trains, and many of them are now used on other divisions of the Southern Pacific. During the summer and early autumn, long trains with refrigerator cars have to be moved in the eastward direction; such trains usually consist of 85 to 100 wagons, constituting a total weight of 4,300 tons. They must be hauled at high speeds and on regular schedules because of the perishable nature of the loads. Three of the single-expansion articulated locomotives are used to handle such a train over the 2·5 per cent. ruling grade. One engine alone works the train from the summit on the descending grade of 2·3 per cent. On passenger service, the locomotives haul trains of 14 to 16 coaches over the ruling grade without assistance, and easily maintain the required schedules.

Cast Steel Frames Used

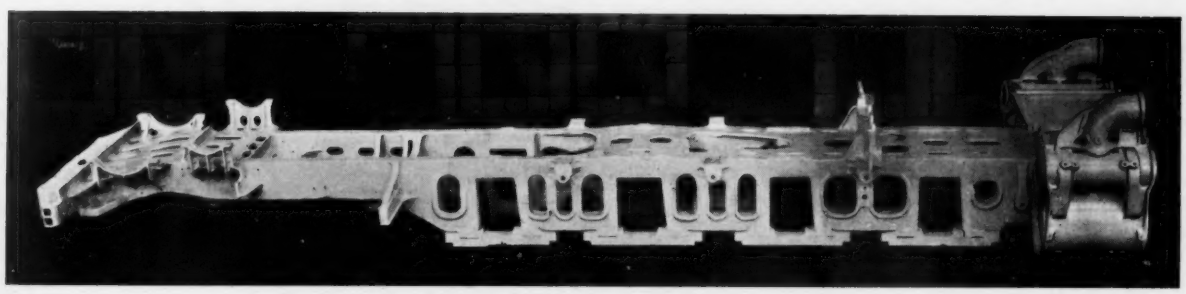
The design of the locomotives recently completed is mainly similar to that of the previous ones; the principal difference is that the new ones have engine beds of cast steel for the front and back units, replacing the bar frames used on the previous locomotives. These beds include integral cylinders and saddles, cross-bracings, valve motion bearers, and other components, and we are able to illustrate the front and rear cast steel units. The four high pressure cylinders measure 24 in. × 32 in., and the coupled wheels are 5 ft. 3½ in. diameter outside. The boiler has a diameter of 7 ft. 10 in., and the steam pressure is 250 lb. per sq. in. with an evaporative surface of 6,468 sq. ft., and a superheater surface of 2,601 sq. ft.; the combined heating surfaces of the locomotive thus total 9,069 sq. ft.

The grate area is 139 sq. ft., giving a ratio to heating surface of 1 to 46·5. The combustion chamber extends a distance of 5 ft. 8 in. into the barrel of the boiler. The total wheelbase of the locomotive alone is 67 ft. 3 in., but the driving wheelbase of each unit is only 16 ft. 11 in. Lateral motion axleboxes give a rigid wheelbase of only 11 ft. 4 in. for each unit, and the total base of tender and engine combined is 111 ft. 9 in. A preliminary estimate of the weight of the new engines shows approximately 260 tons on coupled wheels, 321 tons for the total engine weight, and about 500 tons for the engine and tender combined. The rated tractive force is 123,400 lb., calculated at 85 per cent. of the boiler pressure.

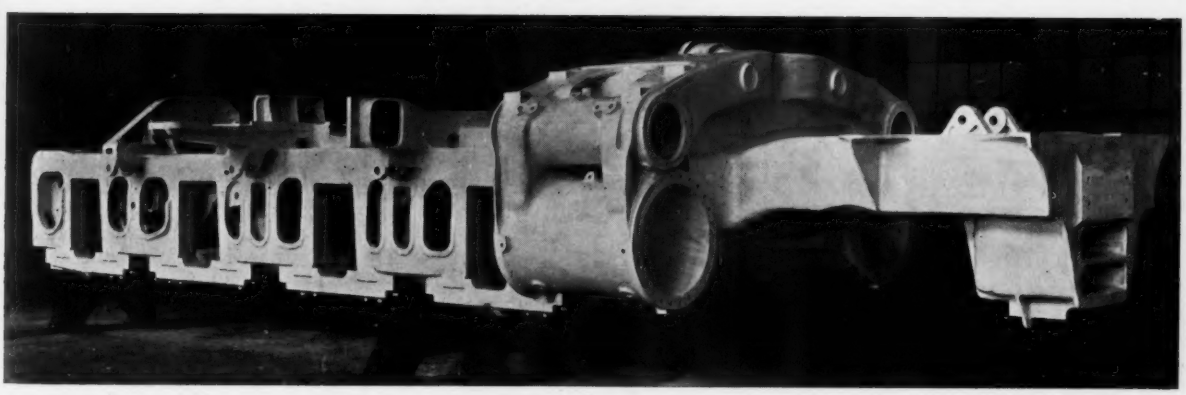
The tenders of the new engines have rectangular tanks holding 22,000 gallons of water, an increase of almost 6,000 gallons compared with the former capacity of 4,662 gallons. When the last of the new engines has been delivered, the Southern Pacific Railway will have a total of 77 locomotives of this type.

View of boiler mounted on front bed casting

General view of locomotive from cab end



Cast-steel framing, front unit



Cast-steel framing, rear unit

NEW ARTICULATED LOCOMOTIVES, SOUTHERN PACIFIC RAILWAY

(*See article on opposite page*)

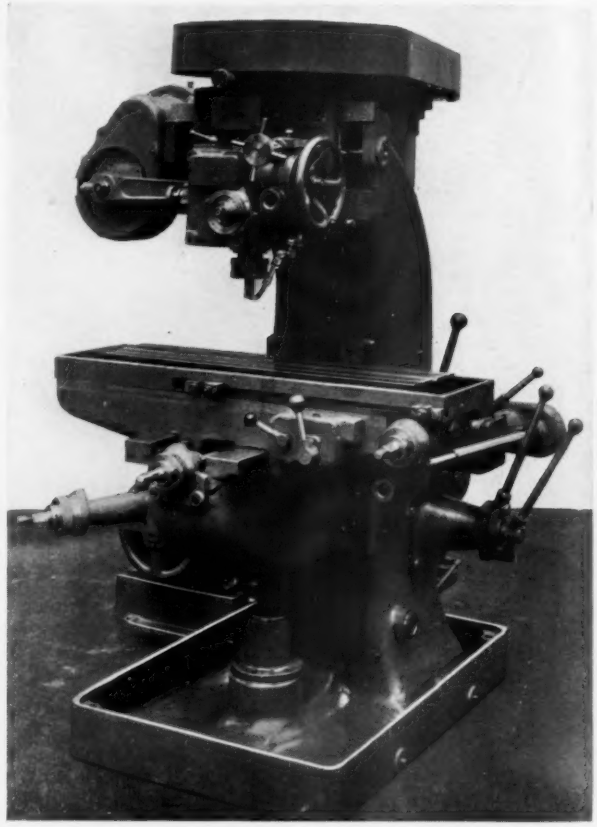
A NEW RAILWAY SHOP MACHINE TOOL

Richards vertical slot drilling, keyway cutting, and milling machine

THE machine tool illustrated herewith represents the latest addition to the range of vertical keyseating machines made by the firm of George Richards & Co. Ltd., Broadheath, near Manchester. The design incorporates a reciprocating crank drive to the spindle slide, the stroke of the latter being 7 in. The actual length of keyway that can be cut by using the crank motion is therefore 7 in. plus the diameter of the cutter being used. As the largest cutter the machine will take is $1\frac{5}{8}$ in., a keyway of a maximum length of $8\frac{5}{8}$ in. can be machined through the medium of the crank motion. Longer keyways, however, can be cut by using the automatic longitudinal feed to the table, which has a traverse of 20 in. Thus, again adding the diameter of the cutter, a keyway $21\frac{5}{8}$ in. long can be machined by this method. Actually, of course, it is possible to use both methods for longer keyways up to a maximum of 27 in., although this procedure should be followed only in exceptional cases.

When using the crank motion to the spindle slide, the vertical feed is applied at each end of the stroke, and is automatically tripped when the required depth is reached, the table of course being locked in position. When using the automatic feed to table, the cutter slide remains stationary, the cutter being fed to the depth required, and the keyway or slot produced at one traverse of the table. The table has hand adjustment vertically, transversely and longitudinally, with index dials provided to each motion. Six rates of speed are provided to the spindle, ranging from 250 to 1,000 r.p.m., and operated through two levers at the side of the machine, and similarly six rates of traverse to the spindle slide horizontally are provided for each spindle speed—thus a total range of 36 rates of traverse are available to the spindle slide by crank motion. Five rates of feed are given in the vertical direction ranging from ·0025 in. to ·0125 in., whilst the table has six reversible feeds longitudinally ranging from ·0004 in. to ·0026 in. and each range is entirely independent of the other. Ordinary cylindrical shafts clamped in the vee of the table, are immediately and accurately centred by a positioning plate.

It will be appreciated that in addition to keyway cutting, this new machine can be usefully employed for a variety of plain milling operations of a light character. The machine can be arranged for either single pulley or direct motor drive. The motor drive transmission is by Tex ropes, from a 3-h.p. motor.



General view of the new machine

Speed Restriction Boards, Swiss Federal Railways

IN our issue of February 7, 1936, we gave some particulars of the new three-aspect distant signals of the Swiss Federal Railways and in our issue of October 30, 1936, we published photographs illustrating them and some other signals also, corresponding to those shown on the diagram of Brugg station which accompanied the former article.

The left-hand illustration we now reproduce shows the usual form of speed restriction board, in this case marked with two limits, the upper figure applying to ordinary trains, and the lower to the Red Arrow railcars and special light-weight expresses. These boards are placed 300 m. (328 yd.) before the spot where the speed restriction begins, which is marked by the striped signboard shown in the right-hand illustration.

RAILWAY NEWS SECTION

PERSONAL

Mr. P. Dodds, Chief Technical Assistant in the Estate & Rating Surveyor's Office, North Eastern Area, L.N.E.R., has been appointed Assistant to the Estate & Rating Surveyor, North Eastern Area.

Mr. J. Boyd, who has been appointed Principal Assistant to the Chief Mechanical Engineer for Outdoor Machinery in the Horwich Division of the L.N.W.R., and later of the L.M.S.R. Mr. Boyd went to Euston as Chief Outdoor Machinery Assistant to the C.M.E. in 1932.

Mr. E. H. Gray, who has retired from the post of Chief Mechanical Engineer, Rhodesia Railways (see THE RAILWAY GAZETTE of July 16) was born in County Westmeath, Ireland, in 1875. His early engineering experience was

We regret to record the death on August 22, while returning home on leave from Penang, of Major John Charles Garth Spooner, M.C., Chief Engineer, Way and Works, Federated Malay States Railways. Major Spooner, who was 54 years of age, was educated at Marlborough, and entered the F.M.S. Railways as Junior Assistant Engineer in 1903. He was promoted to District Engineer in 1912, and to Senior District Engineer in 1921. From

Elliott] [*& Fry*

Mr. J. Boyd

Appointed Principal Assistant to the Chief Mechanical Engineer for Outdoor Machinery, L.M.S.R.

Mr. E. H. Gray

Chief Mechanical Engineer, Rhodesia Railways, 1924-1937

The late Major J. C. G. Spooner

Chief Engineer, Way and Works, F.M.S. Railways, 1929-1937

Machinery, on the amalgamation of the Electrical and C.M.E.'s Departments, L.M.S.R. (see our issue of August 20), received his early training as an apprentice in electrical engineering for four years with Mechan & Sons, Glasgow, and at the Glasgow Technical College. From 1904 to 1907 he served a further apprenticeship with Cowans, Sheldon & Co. Ltd., of Carlisle, and afterwards was in charge of the erection and testing of large steam, hydraulic and electrical plants supplied by this firm in this country and in the Far East. From 1909 to 1911 Mr. Boyd served as an engineer on the Fleetwood and Belfast mail boats, with a period on foreign trade service with Elders & Fyffes. From 1911 to 1913 he was Inspector of Marine Work and Resident Engineer supervising the construction of new steamers for the Lancashire & Yorkshire Railway. In 1913 he was appointed Superintendent Marine Engineer at Goole, Lancashire & Yorkshire Railway, and was responsible for the maintenance of that company's 26 ships. In 1922 he was appointed, under the Chief Mechanical Engineer, the Assistant in charge of Outdoor

gained in the workshops and drawing office of Beyer Peacock & Co. Ltd., at Gorton, Manchester, and at the same time he studied at the Manchester Technical College. In 1900, during the South African war, he joined the Imperial Military Railways at Bloemfontein as a draughtsman, and was subsequently promoted Chief Draughtsman in the service of the Central South African Railways, which were incorporated in the South African Railways and Harbours in 1910. From 1912 to 1914 Mr. Gray acted as Chief Mechanical Engineer at Pretoria, Bloemfontein, and Maritzburg. During this time he served on various commissions and committees concerned with the organisation of the Mechanical Department. Mr. Gray took the position of Chief Mechanical Engineer, Rhodesia Railways in 1924, with headquarters at Bulawayo.

Mr. W. Telford, Stationmaster at Pallion and Millfield, L.N.E.R., is retiring at the end of September after nearly 50 years' service with the company. He has been a stationmaster for over 24 years.

1925 to 1927 he acted as Engineer for Construction, and was appointed Chief Engineer, Way and Works, in 1929. From 1915 to 1919 Major Spooner served with the R.F.A. and the R.G.A. in France, and was awarded the Military Cross. (See editorial note on page 381.)

Mr. F. P. Oliver, who retired from the position of Secretary of the Local Boards of the B.A. Great Southern and B.A. Western Railways at the end of June (see THE RAILWAY GAZETTE of August 6), was tendered a farewell in the form of a cocktail party given at the Railway Building, Buenos Aires, by the local directors and chief officers of both railways on July 30, when he was presented with a silver salver, inscribed with the signatures of his ex-railway colleagues. The presentation was made by Dr. G. E. Leguizamon, Chairman of the local boards of the two companies, who remarked that the occasion was a sad one for him personally, in view of the close association which had existed so long between him and Mr. Oliver, and said that by the retirement of Mr. Oliver

the Southern and Western Railways had lost a highly valued and meritorious servant. Mr. Oliver suitably replied, thanking Dr. Leguizamon for his kind words, and all present for their handsome gift.

Mr. S. Derry, Assistant to the Traffic Manager for Development and Statistics, Southern Railway, will retire on October 1, and is to be succeeded by Mr. W. J. Shorter. Mr. Derry joined the London & South Western Railway in September, 1893, as a junior clerk at Exeter, and in May, 1900, was transferred to the Office of the Superintendent of the Line at Waterloo. In November, 1923, after the amalgamation of the railways, Mr. Derry joined the Indoor Commercial Manager's Office, Southern Railway, and occupied various positions in the Excursions and Fares Departments. In April, 1930, he joined the Development Section of the Traffic Manager's Office at Waterloo, when this section was created under Mr. J. B. Elliot. In March, 1933, he was appointed Chief of the Fares and Excursions Section of the Commercial Assistant's Office, and in January, 1934, became Assistant to the Traffic Manager for the Development of Traffic. In April, 1936, Mr. Derry took over the supervision of the Statistical Section of the Traffic Manager's Office, in addition to the development of traffic.

Mr. S. Derry

Assistant to the Traffic Manager for Development and Statistics, Southern Railway, 1936-37

Mr. W. J. Shorter, who, as recorded above, is to succeed Mr. S. Derry as Assistant to the Traffic Manager for Development and Statistics, Southern Railway, joined the S.E. & C.R. as a clerk at Selsdon Road in May, 1899. After serving at various stations in many capacities, including a spell at Folkestone Harbour in connection with Continental work, Mr. Shorter was appointed to the Office of the Superintendent of the Line, S.E. & C.R., in January, 1920. After the amalgamation of the railways, he was transferred in November, 1923, to the Indoor Commercial Manager's Office, Southern Railway; and in April, 1930, when Mr. Derry joined the Development Section, Mr. Shorter became Deputy Chief of the Fares and Excursion Section of the Commercial Assistant's Department.

Mr. W. J. Shorter

Appointed Assistant to the Traffic Manager for Development and Statistics, Southern Railway

In January, 1934, Mr. Shorter was appointed Chief of the Fares and Excursions Section, and in April, 1936, he became Chief of the Fares, Excursions & Season Ticket Sections. Mr. Shorter is a Member of the Institute of Transport.

French National Railways Appointments

M. Le Besnerais, General Manager, Northern Railway of France, has been appointed General Manager of the newly formed French National Railways Company (see editorial note on page 381). M. Surleau, General Manager of the Alsace-Lorraine Railways, has been appointed Deputy General Manager of the National Company. A portrait and biography of M. Le Besnerais were published in our issue of January 12, 1934, and of M. Surleau on January 31, 1936.

Mr. T. H. Watermeyer, General Manager, South African Railways and Harbours, is returning to South Africa next week, by the *Stirling Castle*, leaving Southampton on September 10.

It is with regret that we record the death on August 27 of Mr. Andrew Mellon, the United States banker and statesman. Mr. Mellon became head of the banking house of Mellon & Sons (later the Mellon National Bank) at the age of 25. For a time he was associated with Henry C. Frick, a prominent figure in U.S.A. railway finance, but his influence was exercised from the background and without bringing his name prominently into the records of railway financial history. Mr. Mellon was appointed Ambassador to London by President Hoover in 1932. A year ago his total wealth was estimated at £40,000,000, and scientific research benefited to the extent of millions of dollars from his gifts. He died at the age of 82.

We regret to record the death in London on August 27, at the age of 83, of Mr. James Meadows Rendel, Chairman of the Assam Bengal Railway, and a former Director of the

A view of the remains of the stone railway at Hay Tor, Devon. A specimen of the unusual stone rails has been placed in the Science Museum, London. The line was briefly described in our issue of September 11, 1936

Southern Punjab Railway and of H.H. the Nizam's Guaranteed State Railways. He was the son of Sir Alexander Rendel, for many years Consulting Engineer of the Indian State Railways. Mr. Rendel, who was called to the bar at the Inner Temple in 1880, concerned himself closely with the complicated questions arising from the right of the Government of India to take over the railway systems from the companies that had created them, and was active in the interests both of shareholders and railway servants.

The funeral took place at Golders Green Crematorium on Monday, and was attended by the following representatives of Indian railways:—

Sir Ernest Bell (Chairman, South Indian Railway); Mr. G. H. Ormerod (Managing Director, Assam Bengal Railway), also representing Sir Walter Lawrence (Director); Mr. R. L. Bliss (Director, Assam Bengal Railway); Mr. W. H. J. Gore (Secretary, Assam Bengal Railway); Mr. R. Mowbray (Government Director, Assam Bengal Railway), representing the Indian railway companies.

The late Mr. R. E. S. Cooper, whose death on May 4 was recorded in our issue of May 7, left estate valued at £4,854 (£1,188 net). An obituary notice of Mr. Cooper, who was New Works Assistant, Euston, L.M.S.R., until 1929, was published in THE RAILWAY GAZETTE of June 11.

The late Mr. Magnus Volk, whose work as a pioneer of electric traction, and particularly in connection with Volk's Electric Railway at Brighton—the first electric line in Great Britain—was described in our issue and *Electric Railway Traction Supplement* of June 4, left estate valued at £15,560 (£7,815 net).

Mr. R. P. Biddle, Docks and Marine Manager, Southern Railway, has been awarded the Cross of the Legion of Honour, conferred upon him by the President of the French Republic. The French Consul at Southampton, in writing to Mr. Biddle, said that the French Republic wished to reward Mr. Biddle for his services in connection with the link between French and British railways, and also for his contribution to understanding between the two countries when he accepted the chairmanship of the Southampton branch of the Association of Great Britain and France.

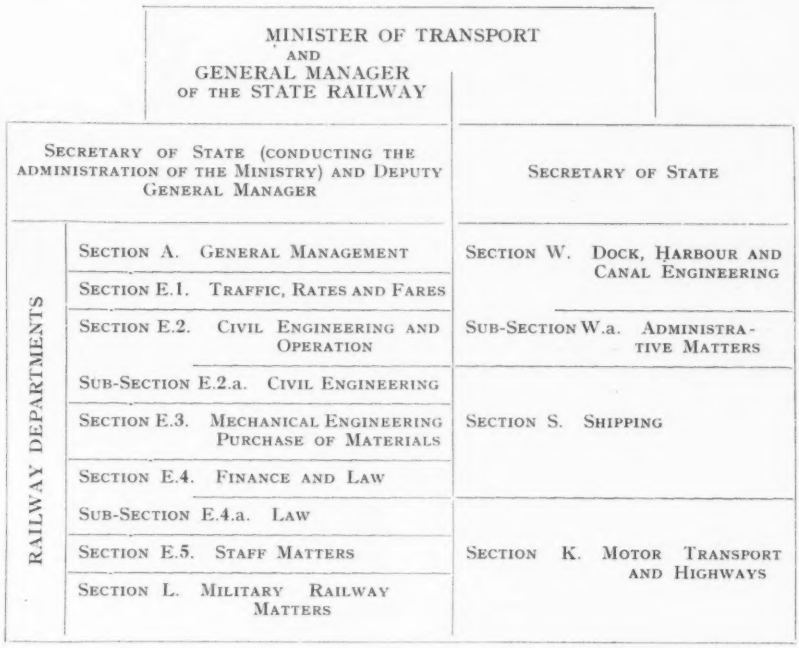
INDIAN RAILWAY STAFF CHANGES

Mr. R. E. Marriott has been promoted to be a Deputy Chief Engineer, State Railways (provisionally permanent), but continues to be employed as Divisional Superintendent, E.I.R.

Mr. E. B. N. Taylor, Khan Bahadur Muzaffar Hussain and Lt.-Col. C. F. Carson, M.C., R.E., have also been promoted provisionally permanent Deputy Chief Engineers, State Railways, but the latter continues to officiate as Agent, N.W.R.

Reorganisation of German Ministry of Transport

Following the modification of the German State Railway Company and the transference of the management of the Reichsbahn to the Ministry of Transport as from January 30, 1937, with Dr. Julius Dorpmüller, General Manager, acting also as Minister of Transport (as already recorded in our columns), the Ministry has been reorganised in accordance with the accompanying diagram to cover all forms of transport except air. It is understood that the supervision of private rail transport is conducted by officials nominally now attached to the ordinary Reichsbahn staff and responsible for seeing that public regulations are complied with by those undertakings.



STAFF AND LABOUR MATTERS

Railway Staff National Tribunal Decision No. 3

Following a meeting of the executive committee of the Railway Clerks' Association on Sunday last, August 29, it was announced that the association had accepted Decision No. 3 of the Railway Staff National Tribunal. Thus the decision has now been accepted by all three railway trade unions, and it is understood that the four main-line railway companies are arranging to give full effect as from August 16 to the decision of the tribunal which:—

(*a*) ends the percentage deduction from earnings. This has operated since March, 1931. It was originally 2½ per cent. from all earnings, with a further 2½ per cent. on earnings in excess of 40s., and was reduced at subsequent dates; the remaining portion, which is now discontinued, is 1¼ per cent.

(*b*) restores the standard rates of night duty, night overtime, and Sunday duty. As a result the ordinary night duty rate is increased from time-and-one-eighth to time-and-a-quarter; the night overtime rate from time-and-three-eighths to time-and-a-half, and the Sunday duty rate from time-and-one-third to time-and-a-half.

(*c*) adds 1s. a week to the rates of pay of adults in conciliation grades the rates of which are at present below 45s.

(*d*) gives to staff which works on Whitsun Monday or August Bank Holiday, a day off, with pay on another day.

(*e*) gives cost of living bonus to certain staff which, by reason of a decision of the National Wages Board, does not at present receive it.

(*f*) gives other minor concessions to a few specially low paid workers, and also to certain clerks working during the night period.

BRITISH OXYGEN CO. LTD.—The British Oxygen Co. Ltd. has acquired a controlling share interest in the Odda Smeltewerke A-S of Norway, which is stated to be the largest manufacturer of carbide imported into Great Britain.

Accelerations on the Midland Section, L.M.S.R.

When the 1937-38 winter timetable comes into force on September 27, the L.M.S.R. will introduce a comprehensive reorganisation of its services between London (St. Pancras), Leicester, Nottingham, Sheffield, Manchester, Leeds, and Bradford. As the outcome of the trial runs which were made over these routes in April this year, wholesale cuts—up to 42 min. per train—are to be effected in the running times between these places.

The service between St. Pancras and Manchester (Central) via Leicester and Derby has been completely reorganised, the fastest overall times by this route being reduced from 3 hr. 55 min. (northbound) and 3 hr. 57 min. (southbound) to 3 hr. 35 min. and 3 hr. 38 min. respectively. Eight expresses from St. Pancras to Manchester are being speeded-up by a total of 142 min. and 7 from Manchester to St. Pancras by a total of 144 min. The maximum acceleration of any one train on this route will be 42 min. An important feature of the alterations to this service will be the introduction of a new restaurant car express leaving Manchester (Central) at 6.20 p.m. and arriving St. Pancras 9.58 p.m., with stops at Derby and Leicester only. The object of this train is to provide a later service for business travellers from Manchester to London and to relieve The Comet express which leaves Manchester (London Road) for Euston at 5.45 p.m. In connection with the accelerations most of the expresses which up to the present leave St. Pancras for Manchester at 25 minutes past the hour will leave instead at 30 minutes past, while the departure times of several trains from Manchester are also being altered.

New high-speed expresses for business travellers, performing the journey of 158¼ miles each way in 2 hr. 52 min. non-stop, are being introduced, leaving Sheffield for St. Pancras at 10.43 a.m. and St. Pancras for Sheffield at 5.10 p.m. Arising out of the remodelling of the St. Pancras-Manchester and St. Pancras-Leeds services, both Leicester and Nottingham will be brought nearer to London in journey time than has ever previously been the case. The 10.30 a.m., 12.30, 2.30, and 8.0 p.m. expresses from St. Pancras will all run to Leicester, 99·1 miles, in 99 min. (average 60·05 m.p.h.) and the 10.21, 11.23 a.m., 3.8, 4.11, 4.37, and 8.19 p.m. expresses from Leicester to London at a similar speed. To Nottingham, the 9.5 a.m., 2.10, 4.20, and 6.20 p.m. from St. Pancras will cover the 123·5 miles in 123 min. (60·2 m.p.h.) and the 9.47 and 11.18 a.m. from Nottingham will run to London at the same speed.

Owing to the large number of speed restrictions on account of mining operations which are in operation north of Trent and Nottingham, the L.M.S. will not be able to effect the same degree of acceleration between these points and Leeds and Bradford as is being achieved south of Trent and Nottingham. The overall journey times between St. Pancras and Leeds and Bradford will benefit considerably, however, by the accelerations on the southern section of the main line. The maximum savings in journey time, by the 3.30 p.m. from St. Pancras, will be 20 min. London-Sheffield, 21 min. London-Leeds, and 24 min. London-Bradford, while eight other northbound services to Yorkshire cities will benefit by from 5 to 15 min. In the southbound direction, journey times from Bradford and Leeds to St. Pancras will be speeded-up by an aggregate of 104 min. daily (6 trains) and by 129 min. (9 trains) so far as Sheffield to London is concerned.

Anglo-Scottish expresses by the Midland route will also be speeded-up; the southbound Thames-Forth Express (10.3 a.m. from Edinburgh Waverley), for instance, will arrive St. Pancras 7.17 p.m. instead of 7.55 p.m., an acceleration of 38 min. It will cover the 105·3 miles from Melton Mowbray to St. Pancras in 103 min. start-to-stop, at an average speed of 61·3 m.p.h. Apart from the accelerations of London trains, the L.M.S. is improving many of the train services on its North and West route (Leeds, Sheffield, Derby, Birmingham and Bristol) so as to shorten journey times by 12 to 81 min.

As a result of the new speed-up the number of L.M.S.R. trains making regular journeys at start-to-stop average speeds of 60 m.p.h. or over will be increased from 29 to 62.

L.N.E.R. Winter Service Accelerations

The L.N.E.R. winter timetables, which come into force on September 27, will see the extension of accelerated travel by streamlined trains to the West Riding and East Anglia. The former, to be known as the West Riding Limited, will run non-stop between King's Cross and Leeds in 2¾ hr. and will also serve Bradford, and (by connecting trains) Halifax. The timings are designed to give travellers from Yorkshire a long afternoon in London, with an arrival home in the early night hours. Leaving Bradford at 11.10 a.m., and Leeds at 11.31 a.m., the up West Riding Limited will reach King's Cross at 2.15 p.m. A connection from Halifax at 10.40 a.m. will give a 3-hr. 35-min. service to London. The down train is timed to leave King's Cross at 7.10 p.m., reaching Leeds at 9.53 p.m. and Bradford at 10.15 p.m., with a Halifax connection arriving at 10.51 p.m. These services will be provided from Mondays to Fridays inclusive. The name West Riding Limited, proposed by an L.N.E.R. employee in the Goods Department at Cambridge, has been chosen from 675 suggestions put forward by 304 people. As in the Coronation express, meals will be served to passengers in their seats throughout the train.

Among the preliminary work in connection with the introduction of faster London—Yorkshire services is the strengthening of bridge No. 60, carrying the main line over the River Calder, immediately south of Wakefield. This will necessitate a speed restriction at first, and ultimately the diversion of all trains via the Kirkgate loop for about a fortnight, as a prelude to the resumption of unrestricted running on the main line. The contractor for the work is Dorman, Long Limited.

A further improvement in London—Yorkshire connections will be the acceleration of the up Yorkshire Pullman by 15 min. to a 3-hr. 45-min. run from Harrogate to London, including its diversion *via* York and a stop there from 11.40 to 11.45 a.m. Through Pullman cars will be run from Wakefield (Saturdays excepted) and Leeds (Saturdays only), to be attached to the Yorkshire Pullman at Doncaster. The working of the down train remains unaltered.

The Eastern Counties benefit by the introduction of the East Anglian, a fast train giving a service in 80 min. between London and Ipswich, and in 2 hr. 15 min. between London and Norwich. The up train will leave Norwich at 11.55 a.m., and Ipswich at 12.50 p.m. arriving in Liverpool Street at 2.10 p.m. Returning from London at 6.40 p.m., the train will arrive at Ipswich at 8.0 p.m. and Norwich at 8.55 p.m. New coaches are being built, which, although of the standard teak finish externally, will be divided internally into sections on the lines of the Coronation stock. The "Sandringham" class locomotives to be used will be streamlined. As recorded in our issue of August 13, the Liverpool Street—Cambridge service is also being improved by additional buffet car expresses.

Forthcoming Events

Sept. 4–12.—Institution of Railway Signal Engineers. Summer Meeting Cruise.

Sept. 6–9.—Institute of Metals, at Department of Applied Science, Sheffield University. Autumn Meeting.

Sept. 9 (*Thurs.*).—Railway Club, at Royal Scottish Corporation Hall, Fetter Lane, London, E.C.4, 7.30 p.m. "Some Railway Schemes in the West Midlands, 1833–1865," by Mr. J. Simmons.

Sept. 11 (*Sat.*).—Stephenson Locomotive Society (London). Visit to Old Oak Common Running Sheds, G.W.R.

Sept. 14 (*Tues.*).—Permanent Way Institution (Guildford). "A Realistic View of the Railway Future," by Mr. W. A. Willox.

Sept. 16–25.—*The Model Engineer* Exhibition, at Royal Horticultural Hall, Vincent Square, London, S.W.1.

Sept. 25 (*Sat.*)—Permanent Way Institution (Manchester-Liverpool), at Blackpool, 3 p.m. "Railway Drainage," by Mr. F. McCandlish.

New Surface-Line Rolling Stock for the London Passenger Transport Board

The first of 116 new cars for use on the surface lines of the London Passenger Transport Board are now being placed in service and incorporate many notable refinements. The vehicles are semi-permanently coupled together into two-car units, the outer ends having automatic couplers electro-pneumatically controlled by push buttons in the driver's cab. These couplers complete all the connections, mechanical, electrical and pneumatic. Each car is 51 ft. 1¼in. long and has seating for 40 passengers, as well as two tip-up seats at the end for use during rush hours.

The new cars have air-worked doors which, at busy times will be opened and closed by the guard as on a tube train, but during slack hours each door may be opened from inside or outside by press-button control by passengers. Externally the windows are flush with the panels. Main pillars in the all-steel frame construction have been reduced to a minimum and are triangular in section thus affording the minimum obstruction to the passengers' view.

The interior is simple but attractive. All seats are fitted with loose cushions and the use of chromium plate together with the decorative veneer and paint used for the finish gives the cars a light and roomy appearance. The lighting is powerful and the fittings are of a new design. Straphangers consist of a flexible rubber stem with a ball at the end.

The new stock can be accelerated and braked very much more quickly than the present stock. Whereas the latter can be accelerated at 1 to 1·2 m.p.h. per sec., the new stock can pick up speed at 2 m.p.h. per sec. The braking speed of the new stock is 3 m.p.h. per sec., and a train of eight cars travelling at 40 m.p.h. can be pulled up dead in 500 ft., or practically its own length. At a demonstration of a 4-car train of the new stock last Wednesday it was shown that both starting and stopping were remarkably smooth, as also was the running of the train at speeds up to the maximum of 50 m.p.h. These improvements have been made possible by the use of metadyne control.

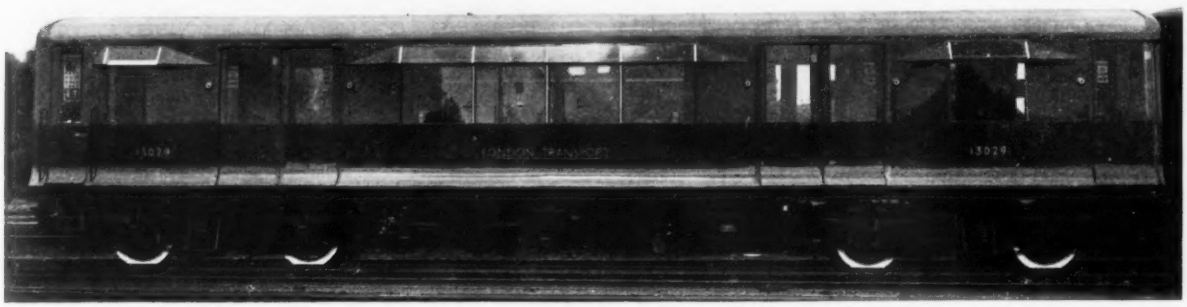
An ingenious new feature is that the metadyne, which controls the supply of current to the traction motors and permits of regenerative braking, draws the air which it requires for self-cooling from inside the car in such a way as to provide forced ventilation. To separate the smoking from the non-smoking sections of the car double glass panels are used between the seat backs, and air is drawn by the metadyne through the space between the glass panels; thus tobacco smoke is immediately drawn out of the car.

The bogies are of all-welded construction, and the 36-in. wheels are mounted on Skefko or Hoffmann roller bearings. The bogie centres have Timken roller bearings. Each 2-car unit which weighs 71½ tons is driven by four G.E.C. traction motors of 150 h.p. one hour rating, one motor fitted to each bogie. In addition to the regenerative braking the trailing axles are equipped with Westinghouse electro-pneumatic brakes.

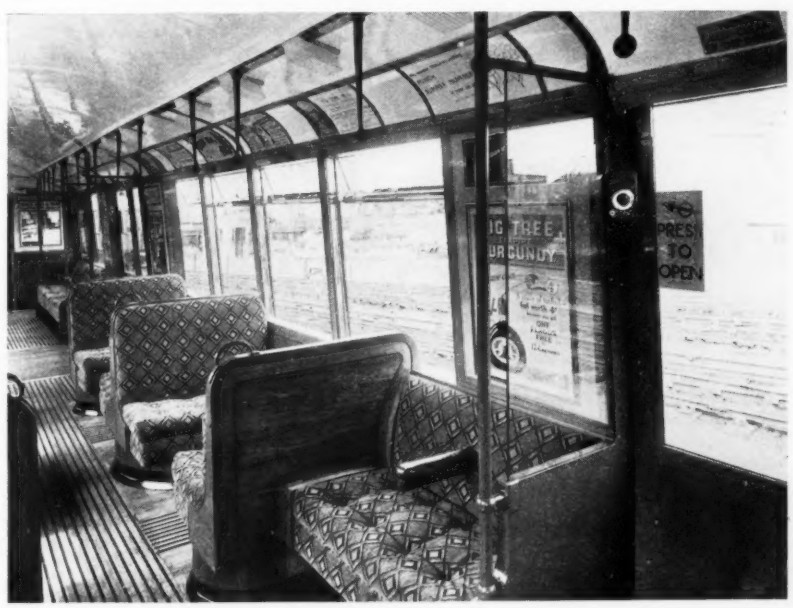
The main contractors for the new cars are the Gloucester Railway Carriage & Wagon Co. Ltd., the Birmingham Railway Carriage & Wagon Co. Ltd., and the Metropolitan Vickers Electrical Co. Ltd.

The sub-contractors include :—

Lightalloys Limited ; G. D. Peters & Co. Ltd. ; Geo. Spencer Moulton & Co. Ltd. ; Jonas Woodhead & Sons Limited ; J. Holdsworth & Co. Ltd. ; Equipment & Engineering Co. Ltd. ; Benjamin Electric Limited ; Klaxon Limited ; Tucker Armoured Plywood Co. Ltd. ; Lace Web Spring Co. Ltd. ; Valor Co. Ltd. ; and Clifford & Snell Limited.



One of the new all-steel cars for the surface lines of the London Passenger Transport Board



Interior view of new L.P.T.B. surface line cars

NOTES AND NEWS

Dutch Railway Merger.—The Netherlands State Railway Company and the Holland Railway Company, are to be merged into a new company which has now been formed under the title of the Netherland Railways N.V. with an issued capital of fl. 10,000,000. Of this capital, fl. 9,998,000 are owned by the Government. The two railways taken over have been worked under one management since 1917.

Buffer-Stop Collision at Cape Town.—On August 30, an empty electric passenger train collided with a buffer stop at Cape Town station with such force that it mounted the platform and crashed through 40 ft. of the two-storey brick station offices beyond. The motorman jumped clear, but two persons on the station premises were killed, one is missing (believed killed) and six were injured.

Light Opera for Waiting Passengers at Waterloo.—On Friday last, passengers at Waterloo station had their waiting time beguiled with music from loud speakers between the announcements about the trains. The music, mostly light opera, was played on gramophone records. We are informed by the Southern Railway that this was an experiment; it has not yet been decided whether it will be continued.

Vickers' Debenture Stock Redemption.—The directors of Vickers Limited give notice of their intention to redeem on December 1, 1937, at 103 per cent. the whole of the £2,000,000 (nominal) 5½ per cent. first mortgage debenture stock of the company. Stockholders will be paid on October 1, 1937, the full half-year's interest, namely, £2 15s., less tax, on each £100 stock, due on that date, and interest, less tax from October 1 to November 30, 1937, both days inclusive, will be paid with the redemption money. The stock will cease to carry interest after the last-mentioned date.

Air-Conditioned Cars in the U.S.A.—Class I railroads and the Pullman Company on June 30 had 9,311 air-conditioned passenger cars in operation, according to an announcement made by J. J. Pelley, President of the Association of American Railroads. The number of passenger cars that are being air-conditioned is constantly increasing; the railroads and the Pullman Company in the past year have installed air-conditioning devices on approximately 1,700 passenger cars. Of the total number of passenger cars which have been air-conditioned, the railroads on June 30 had 4,751 in service. This included coaches, dining cars and other types of passenger equipment. The Pullman Company on the same date had 4,560 air-conditioned passenger cars in service, including sleeping cars, lounge cars and other passenger equipment. New passenger cars on order on July 1 this year totalled 424, compared with 177 on January 1 this year and 139 on July 1, 1936. The Pullman Company on July 1, this year, had 161 new passenger cars on order.

New Argentine State Railways Railcar Service.—A new railcar service has been inaugurated by the Argentine State Railways between Comodoro Rivadavia and Colonia Sarmiento. Whereas the steam trains used to take from 8 to 10 hr. to cover the intervening 125 miles of mountainous country at a fare of £2, the new service takes only 4 hr. at a fare of 17s. 6d., so that both the time and the fare have been halved.

Canadian Pacific Earnings.—Gross earnings of the Canadian Pacific Railway for the month of July, 1937, amounted to $12,042,000, an increase of $465,000 in comparison with July, 1937. In the working expenses of $10,947,000 there was an increase of $349,000, leaving net earnings $116,000 higher, at $1,095,000. Aggregate gross earnings for the first seven months of 1937 were $78,832,000, an improvement of $5,210,000, and the net earnings of $9,355,000 were higher by $1,585,000.

Canadian National Earnings.—For the month of July, 1937, gross earnings of the Canadian National Railways amounted to $16,662,985, an increase of $1,366,690 over July, 1936. Operating expenses ($15,704,086) advanced by $494,994, to leave net earnings of $958,899, which were $871,696 higher than for July, 1936. Aggregate gross earnings from January 1 to July 31, 1937, were $111,659,299, an improvement of $10,901,576, and the net earnings for the seven months were $7,626,847, an increase of $5,064,604.

Chesapeake Consolidation Plan.—The Interstate Commerce Commission has recommended approval of the acquisition by the Chesapeake & Ohio Railway Company of control of the Erie Railroad and the New York Chicago & St. Louis Railroad Company. According to Reuters, control would be obtained by the acquisition of 57·02 per cent. of the New York Chicago & St. Louis Railroad's stock and 55·68 per cent. of the Erie Railroad Company's stock, both of which are now held by the Virginia Transportation Corporation and the Alleghany Corporation.

Railway Servants' Orphanage.—The report for the year to April 30, 1937, of the Railway Servants' Orphanage, Derby, states that during that period 45 children were admitted, and at April 30, 220 children (158 boys and 62 girls) were on the books. Consistently satisfactory school reports on the children have been received. Ten boys and one girl have been awarded free scholarships during the year tenable at advanced schools in the town. The total receipts of £16,751 as shown in the accounts are £2,225 higher than for the previous year, but £2,067 of this increase represents the stock presented to the orphanage by the Derby Concert Committee, which could not be included in the previous year's accounts. The continued increase of support from the railwaymen themselves is encouraging.

Canal Service to the Continent.—The Grand Union Canal Company states that it has completed negotiations for the establishment of a new all-water transport service between this country and the Continent. The first vessel of the new line, which is to be called the Regent's Line, is to sail from Antwerp to the Regent's Canal Dock on September 4, and it has been arranged that thereafter there shall be two sailings weekly from Antwerp (Saturday and Tuesday) and from London (Wednesday and Saturday).

New Channel Tunnel Proposal.—At the recent International Congress on Urban Subterranean Problems, held in Paris, a delegate, M. Basdevant, suggested that a Channel tunnel scheme should provide for the passage of motor vehicles of all kinds. Provision would also be made for railway traffic, but this, in his opinion, would be of secondary importance. He suggested a route from Sangatte, near Calais, to a point east of Folkestone, with a 1 in 10 incline at each end. Two years was the estimated time for construction, and £150 million the cost.

New European Air Communications.—This summer has seen the inauguration of several air routes both within Europe and providing external connections. Italy instituted a Turin-Paris service, and another from Brindisi to Haifa (Palestine) via Athens and Rhodes, on April 7; the latter line is worked by flying boats. On April 4 new German air lines were opened between Hamburg and London, and between Berlin and Stockholm. The Berlin-Stockholm journey is made non-stop over the distance of 980 km. (608·9 miles), and is the longest regular non-stop flight in Europe.

Northern Ireland Traffics.—Passenger receipts for the first five months of 1937 on railways wholly in Northern Ireland amounted to £86,226, against £84,876 for the corresponding period of 1936, although the number of passengers (exclusive of season-ticket holders) fell from 1,681,285 to 1,679,504. Merchandise and mineral tonnage for the five months fell from 279,115 tons to 255,936 tons, and the total goods traffic receipts from £101,352 to £93,896. Railways partly in Northern Ireland carried 1,758,468 ordinary passengers in the first five months of 1937, against 1,907,187 in the first five months of 1936, but total passenger receipts rose from £148,796 to £150,843. The quantity of merchandise and minerals carried fell from 415,830 tons to 397,630 tons, and total goods traffic receipts from £275,401 to £265,446. On the purely northern railways the number of live stock carried in the first five months of 1937 rose from 64,787 to 86,460, and on the cross-border railways from 289,759 to 296,551.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 34th Week			Totals to Date		
	1937	1936	Inc. or Dec.	1937	1936	Inc. or Dec.
	£	£	£	£	£	£
L.M.S.R. (6,870¼ mls.)						
Passenger-train traffic...	610,000	603,000	+ 7,000	18,076,000	17,365,000	+ 711,000
Merchandise, &c. ...	490,000	469,000	+ 21,000	16,478,000	15,996,000	+ 482,000
Coal and coke ...	249,000	233,000	+ 16,000	8,592,000	8,116,000	+ 476,000
Goods-train traffic ...	739,000	702,000	+ 37,000	25,070,000	24,112,000	+ 958,000
Total receipts	1,349,000	1,305,000	+ 44,000	43,146,000	41,477,000	+1,669,000
L.N.E.R. (6,315 mls.)						
Passenger-train traffic...	423,000	411,000	+ 12,000	11,836,000	11,269,000	+ 567,000
Merchandise, &c. ...	322,000	335,000	− 13,000	11,340,000	10,936,000	+ 404,000
Coal and coke ...	247,000	232,000	+ 15,000	8,317,000	7,830,000	+ 487,000
Goods-train traffic ...	569,000	567,000	+ 2,000	19,657,000	18,766,000	+ 891,000
Total receipts	992,000	978,000	+ 14,000	31,493,000	30,035,000	+1,458,000
G.W.R. (3,738½ mls.)						
Passenger-train traffic...	278,000	286,000	− 8,000	7,638,000	7,407,000	+ 231,000
Merchandise, &c. ...	212,000	193,000	+ 19,000	6,688,000	6,427,000	+ 261,000
Coal and coke ...	119,000	106,000	+ 13,000	3,758,000	3,374,000	+ 384,000
Goods-train traffic ...	331,000	299,000	+ 32,000	10,446,000	9,801,000	+ 645,000
Total receipts	609,000	585,000	+ 24,000	18,084,000	17,208,000	+ 876,000
S.R. (2,157 mls.)						
Passenger-train traffic...	402,000	409,000	− 7,000	11,371,000	10,788,000	+ 583,000
Merchandise, &c. ...	64,500	64,000	+ 500	2,065,500	2,125,000	− 59,500
Coal and coke ...	29,500	32,000	− 2,500	1,006,500	1,037,000	− 30,500
Goods-train traffic ...	94,000	96,000	− 2,000	3,072,000	3,162,000	− 90,000
Total receipts	496,000	505,000	− 9,000	14,443,000	13,950,000	+ 493,000
Liverpool Overhead ... (6½ mls.)	1,338	1,273	+ 65	44,446	40,815	+ 3,631
Mersey (4½ mls.) ...	3,826	3,783	+ 43	141,572	136,554	+ 5,018
*London Passenger Transport Board ...	545,900	555,300	− 9,400	4,993,900	4,976,100	+ 17,800
IRELAND						
†Belfast & C.D. pass. (80 mls.)	3,852	3,745	+ 107	93,278	93,364	− 86
,, ,, goods	369	526	− 157	16,391	18,882	− 2,491
,, ,, total	4,221	4,271	− 50	109,669	112,246	− 2,577
Great Northern pass. (543 mls.)	14,750	14,500	+ 250	382,100	371,500	+ 10,600
,, ,, goods	9,250	9,150	+ 100	317,950	331,750	− 13,800
,, ,, total	24,000	23,650	+ 350	700,050	703,250	− 3,200
Great Southern pass. (2,076 mls.)	52,738	49,966	+ 2,772	1,252,537	1,242,359	+ 10,178
,, ,, goods	39,338	41,297	− 1,959	1,379,541	1,405,451	− 25,910
,, ,, total	92,076	91,263	+ 813	2,632,078	2,647,810	− 15,732

* 9th week (before pooling) † 35th week

RAILWAY AND OTHER REPORTS

Southdown Motor Services Limited.—An interim dividend of 5 per cent., less tax, is to be paid on September 30, the same as a year ago.

Charles Roberts & Co. Ltd.—An interim payment at the rate of 4 per cent. per annum is to be made on September 30 on the 4 per cent. first debenture stock for the half-year ended September 30, 1937.

Leyland and Birmingham Rubber Company.—The directors recommend a final ordinary dividend of 7½ per cent., plus a bonus of 2½ per cent., making 12½ per cent., less tax, for the year ended June 30, against 7½ per cent. for 1935-36.

Ransome & Marles Bearing Co. Ltd.—The directors recommend a final dividend of 12½ per cent., making 20 per cent. for the year ended June 30 (against 15 per cent. for 1935-36). They also propose to distribute a bonus of one share for every four shares held on October 8. Net profits for the year, after meeting all charges, including taxation, amount to £166,351 (against £116,809).

Craigpark Electric Co. Ltd.—The accounts for the year to March 31 show a profit of £20,091, against £3,877. Out of the total available, £5,000 is placed to depreciation and £17,349 is carried forward.

Cowans Sheldon & Co. Ltd.—Trading profit for the year to June 30 last was £26,125, against £19,157 for the previous year, and the net profit after allowing for rents, interest, &c., receivable, and for certain outgoings, amounted to £31,060, against £18,310. Adding £35,590 brought in gives a total of £66,650, out of which it is recommended to pay a dividend of 10 per cent., to place £10,000 (against nil) to reserve, and to carry forward £41,650. For the previous year the dividend was 7½ per cent.

British and Irish Railway Stocks and Shares

Stocks	Highest 1936	Lowest 1936	Prices Sept. 1, 1937	Prices Rise/Fall
G.W.R.				
Cons. Ord. ...	64¼	45½	63¼	+¼
5% Con. Prefce. ...	126½	116¾	116½	—
5% Red.Pref.(1950)	113	108½	109½	—
4% Deb.	119½	110½	105½	—
4½% Deb.... ...	121	114	111	—
4½% Deb.... ...	129	121	117½	—
5% Deb.	141	134	128½	—
2½% Deb.... ...	79⅛	74	69½	—
5% Rt. Charge ...	136½	130	127½	—
5% Cons. Guar. ...	135¼	127¾	124	—
L.M.S.R.				
Ord.	35⅝	17	32	—
4% Prefce. (1923)	83	52½	76	—
4% Prefce. ...	92¾	81	82	—
5% Red.Pref.(1955)	109¼	103¼	106	—
4% Deb.	111¾	105 9/16	101½	—
5% Red.Deb.(1952)	119⅝	115½	112½	—
4% Guar. ...	106¾	101⅝	99½	—
L.N.E.R.				
5% Pref. Ord. ...	14	9	10	—
Def. Ord.	7¼	4¾	5	—
4% First Prefce.	79¼	55¼	72	—
4% Second Prefce.	31⅞	18¼	29	—
5% Red.Pref.(1955)	100½	77¾	98	—
4% First Guar. ...	104½	98¾	96½	−½
4% Second Guar.	99	90	90	—
3% Deb.	85¾	79	76	—
4% Deb.	109¾	104½	101	—
5% Red.Deb.(1947)	116¼	110½	110½	—
4½% Sinking Fund Red. Deb.	111½	107½	108	—
SOUTHERN				
Pref. Ord.... ...	98¾	82½	92½	—
Def. Ord.	27⅝	20⅛	22¾	−¼
5% Pref.	120¾	118½	113½	—
5% Red.Pref.(1964)	119¾	115¼	113½	—
5% Guar. Prefce.	136	129½	125	—
5% Red.Guar.Pref. (1957)	120	115¾	114	—
4% Deb.	117 13/16	109½	104	—
5% Deb.	140	134	126½	—
4% Red. Deb. 1962–67	116½	110	106½	—
BELFAST & C.D.				
Ord.	9	4½	4	—
FORTH BRIDGE				
4% Deb.	107	105	101½	—
4% Guar. ...	107 5/16	104	100½	—
G. NORTHERN (IRELAND)				
Ord.	19½	9¾	7	—
G. SOUTHERN (IRELAND)				
Ord.	63	41	30	—
Prefce.	65	46	42	+1½
Guar.	97¼	81	71½	+½
Deb.	99¾	83¼	86½	—
L.P.T.B.				
4½% "A" ...	127¾	121	113½	−1
5% "A"... ...	138¼	133½	125½	—
4½% "T.F.A." ...	111½	108⅛	105	—
5% "B"... ...	131¾	123¾	117½	—
"C"	112½	93	82	—
MERSEY				
Ord.	40¾	23	30½	—
4% Perp. Deb. ...	103	98	97	—
3% Perp. Deb. ...	78	74⅝	74⅛	—
3% Perp. Prefce.	68⅞	63¼	66⅛	+1

CONTRACTS AND TENDERS

Kitson & Co. Ltd. has received an order from the Crown Agents for the Colonies for two locomotive boilers for the Mauritius Government Railways.

Wagons for L.M.S.R.

The L.M.S.R. has placed orders for a total of 1,150 wagons comprising 500 20-ton hopper wagons and 650 12-ton goods wagons divided as follow :—

Metropolitan-Cammell Carriage & Wagon Co. Ltd., 300 20-ton hopper ore wagons.
Birmingham Railway Carriage & Wagon Co. Ltd., 200 20-ton hopper ore wagons.
R. Y. Pickering & Co. Ltd., 250 12-ton medium goods wagons, unfitted.
Chas. Roberts & Co. Ltd., 250 12-ton medium goods wagons, unfitted.
G. R. Turner Limited, 150 12-ton medium goods wagons, vacuum fitted.

W. & T. Avery Limited has received orders from the Indian Stores Department for one Avery No. 282-P platform weighing machine.

The A.B.C. Coupler & Engineering Co. Ltd. has received an order from the North British Locomotive Co. Ltd., for 11 wedge-type Goodall drawgears for 4-6-2 01 class locomotives, under construction for the Federated Malay States Railways, to the inspection of the Crown Agents for the Colonies.

Stewarts and Lloyds Limited has received an order for 3,500 solid-drawn black steel boiler tubes and 950 solid-drawn black steel superheater smoke tubes, from the Buenos Ayres Great Southern Railway.

Taylor Brothers & Co. Ltd. has received an order from the Central Argentine Railway for 125 steel tyres for motor bogies.

The Associated Equipment Co. Ltd. has received an order from the Athens Electric Transport Company for 60 A.E.C. Regal single-deck passenger chassis of the special 19-ft. long wheelbase type and with A.E.C. oil engines and fluid transmission system.

The Bengal-Nagpur Railway Administration has placed the following orders :

Craven's Railway Carriage & Wagon Co. Ltd., 100 disc-centred carriage and wagon wheels.
Owen & Dyson Limited, 32 disc-centred carriage and wagon wheels.
M. C. Thomson & Co. Ltd., 7,000 yards canvas cloth.

George Cooper & Sons has received an order from the Bombay, Baroda & Central India Railway Administration for a quantity of stainless steel bolts and nuts to be supplied to the inspection of Messrs. Rendel, Palmer & Tritton.

Whitelegg & Rogers Limited has received recently orders for the supply of 21 Ajax steam-operated firedoors for 15 F, 4-8-2 type locomotives now under construction by Henschel & Sohn for the South African Railways and Harbours Board, and six Ajax air-operated firedoors for 0-8-0 type locomotives now being built by the North British Locomotive Co. Ltd. for the King Kan Railway, China.

Electric Locomotives for South Africa

Metropolitan-Vickers Electrical Co. Ltd. has received from the South African Government Railways & Harbours Board an order for twenty-two 1,200-h.p. 66-ton 3,000-volt electric locomotives, costing nearly £300,000. The locomotives are for service on the Natal line, and have been made necessary by increased traffic and by extensions of the electrified sections which now total 383 route miles and 634 track miles, the latest extension completing a through connection from Durban to Volksrust, which is approximately 140 miles from Johannesburg. The new locomotives will be similar to 120 Metrovick locomotives supplied previously.

The Vulcan Foundry Co. Ltd. has received an order from the Buenos Ayres Great Southern Railway for nine locomotive bogies.

G.W.R. Contracts

The Directors of the Great Western Railway have authorised the placing of the following contracts :—

Extension of Electrified Lines to Ruislip

George Wimpey & Co. Ltd : construction of first section of electrified line between North Acton and Greenford.

Haymills (Contractors) Limited : construction of new rolling stock depot at Ruislip, comprising carriage shed, cleaning shed, repair shops, offices and other works.

For Swindon Works

Dean, Smith & Grace, Limited : supply of a sliding, surfacing and screw cutting lathe.

R. Pratt, Limited : supply of a Fordson shunting tractor.

At the Company's New Laundry, Swindon

T. Broadbent & Sons, Limited : supply of the following : two hydro extractors.

Manlove, Alliott & Co. Ltd. : a tumbler drier.

T. Bradford & Company : two ironing machines.

At the Company's Docks

Penarth Pontoon Slipway & Ship Repairing Co. Ltd. : repairs to dredger *Peeress*.

C. H. Bailey Graham & Co. Ltd. : repairs to tug *Horace*.

Caffin & Co. Ltd. : reconstruction in reinforced concrete of No. 27 tip viaduct at No. 2 Dock, Barry.

Fowey Harbour Commissioners, dredging of inner and outer basins, Plymouth.

Head Wrightson & Co. Ltd. : supply of iron castings, steel forgings, &c., for Nos. 3 and 4 gate anchorages at King's Dock Lock, Swansea.

Works at Various Stations

Grampian Reproducers, Limited : installation of loudspeaker equipment, Cardiff.

Electric Construction Co. Ltd. : supply and erection of Mercury arc rectifier equipment, Fowey Harbour

Pickerings, Limited : supply and erection of two 30-cwt. electric luggage lifts, Leamington.

W. T. Nicholls, Limited : construction of new goods offices and extension of goods shed, Morris Cowley, near Oxford.

George Palmer : reconstruction and lengthening of a bridge over the Aberdare Road, Mountain Ash.

J. Beresford, Limited : supply of an electrically-driven borehole pump, Oxley.

W. T. Nicholls, Limited : alterations to refreshment rooms and provision of a staff hostel, Reading.

East Ferry Road Engineering Works Co. Ltd. : supply of a 3 ton fixed hydraulic crane, Smithfield.

The Demolition & Construction Co. Ltd. : reconstruction and lengthening of a bridge over the roadway, Sutton Scotney.

W. & A. Edgell, Limited : supply and erection of a timber-framed warehouse, Witney.

J. Baker & Bessemer Limited has received an order from the Great Western of Brazil Railway for 50 steel axles and 50 steel tyres for carriages and wagons.

The Crown Agents for the Colonies have recently placed the following orders :—

Dennis Bros. Ltd., Motor lorries.
Aveling-Barford Limited, Motor roller and oil and steam roller spares.
J. S. Craig & Co. Ltd., Paint.
Red Hand Compositions Limited, Paint.
Torbay Paint Company, Paint.
Walpamur Co. Ltd., Paint.
Locke, Lancaster & W. W. & R. Johnson & Sons Limited, Pig lead.
Wm. Bain & Co. Ltd., Pressed-steel piles.
Pulsometer Engineering Co. Ltd., Pumping station plant.
Guest, Keen & Nettlefolds Limited, Rail clips.
United Steel Cos. Ltd., Rails and fishplates.
Bayliss, Jones & Bayliss Limited, Round bar railing.
Appleby-Frodingham Steel Co. Ltd., Round steel joists.
Clyde Rubber Works Co. Ltd., Rubber buffing springs.
Patent Shaft & Axletree Co. Ltd., Steelwork for locomotive turntable.
Ericsson Telephones Limited, Telephone exchange equipment.
Kendall & Gent (1920) Limited, Tube and bolt screwing machine.
W. & T. Avery Limited, Weighing machines.
G. Richards & Co. Ltd., Boring and turning mill.

Tenders are invited by the Egyptian State Railways Administration, receivable at the General Management, Cairo, by September 30, for the supply of 100,000/325,000 wooden railway sleepers for standard gauge and 7,800/16,200 long sleepers for turn-outs.

Tenders are invited by the Egyptian State Railways Administration, receivable by September 28 at the General Management, Cairo station, for the supply of 30-ton low-sided wagons and flat wagons. Tenders are also invited, receivable by November 2, for the supply of 100 perishable goods trucks.

The Chief Controller of Stores, Indian Stores Department (Engineering Section), Simla, invites tenders, receivable by September 22, for the supply of approximately 2,500 mild-steel bearing plates for 90 R.F.F., B.S.S. rails.

The Controller of Stores, Great Indian Peninsula Railway, Gipstore Lane, Lower Parel, Bombay 13, invites tenders, receivable by September 22, for the supply of cylinders required for D-4 type locomotives.

The Chief Engineer, Bengal & North-Western Railway, Gorakhpur, invites tenders, receivable by September 14, for the supply of two clear spans of 40 ft. steel plate girders, M.L. standard type metre gauge, as per Railway Board drawing No. I.R.S. (B) B.A. 200, and five clear spans of 60 ft. steel plate girders M.L. standard type metre gauge, as per Railway Board drawing No. I.R.S. (B) B.A. 220, to be made of steel manufactured in the U.K. or in India. To comply with I.R.S. standard specification for steel girder bridges (No. BI-36) ; sleeper pads, hook bolts and anchor bolts to be included.

OFFICIAL NOTICES

University of London Commerce Degree Bureau

THE Official Institution of the University providing Study Courses for External Students preparing for the Commerce Degree Examinations of the University of London, who are unable to attend regular College Lectures.

For Prospectus apply to Secretary (Mr. H. J Crawford, B.A.), Commerce Degree Bureau, University of London, W.C.1.

The Bengal & North Western Railway Company Limited

THE Board invite applications for service in India for the posts of

TWO ASSISTANT CIVIL ENGINEERS.

The engagement in the first instance would be for a term of three years, with extension to permanent establishment if services satisfactory.

The successful applicants would be appointed to the Company's Junior Scale of Officers in which the commencing salary is Rupees 325 per mensem, plus Rs. 150 overseas pay, rising by yearly increments of Rs. 25 per mensem. Candidates may be appointed at higher rates within the grade according to age and experience, with prospects of promotion to the senior scale district rank, when the salary would be Rs. 750 per mensem, rising by increments to a maximum of Rs. 950 per mensem, plus Rs. 250 or £30 overseas pay in each case.

The selected candidates would be members of the Provident Fund throughout their service.

Free first class passages to and from India in accordance with Lee Commission Rules.

Candidates must be of non-Asiatic domicile, and have obtained an Engineering Degree at a recognised University or passed the Associate Membership examination of the Institution of Civil Engineers, or an examination exempting them therefrom.

Candidates when applying must state their age, and whether married or single; also give a short record of their career in chronological order, with dates.

The selected candidates will be required to pass a medical examination by the Company's Consulting Physician before appointment, and, if appointed, will be required to embark for India about the end of October, 1937.

Applications by letter only, in the handwriting of the candidate, marked on the outside "Assistant Civil Engineer," accompanied by *copies only* of testimonials, should be addressed to the Managing Director, 237, Gresham House, Old Broad Street, London, E.C.2.

South Indian Railway Company, Limited.

THE Directors are prepared to receive Tenders for the supply of :—

PANEL PLATES.

Specifications and Forms of Tender will be available at the Company's Offices, 91, Petty France, Westminster, S.W.1.

Tenders addressed to the Chairman and Directors of the South Indian Railway Company Limited, marked "Tender for Panel Plates," with the name of the firm tendering, must be left with the undersigned not later than 12 Noon on Friday, the 24th September, 1937.

The Directors do not bind themselves to accept the lowest or any Tender.

A charge, which will not be returned, will be made of 5s. for each copy of the Specification.

E. A. S. BELL,
Managing Director.

91, Petty France,
Westminster, S.W.1.
1st September, 1937.

Increases of Railway Charges

Details have now been issued officially of the increases in railway charges which are to take effect on October 1. Posters and notices advising the public of these increases were displayed at all railway stations and depots on Wednesday, and handbills are available on request referring to charges for and incidental to the carriage of merchandise by merchandise train or passenger train or other similar service.

Passenger Fares

Single or return journey fares, season ticket fares, and traders' season ticket fares will be increased by 5 per cent. or thereabouts.

Workmen's fares of less than 5d. will remain unchanged ; for those over 5d. the increase, generally speaking, will be one halfpenny.

Suburban fares within the London Transport area will remain unchanged.

The majority of railway steamboat fares will also be increased by 5 per cent.

Merchandise Charges

Rates for the carriage of merchandise and charges for services and accommodation will (with minor exceptions) be increased as follow :—

The standard charges will be increased by 5 per cent. Copies of the amended scales of standard charges may be obtained from the Railway Clearing House, 123, Seymour Street, London, N.W.1, post free at the usual prices.

The accompanying table indicates the amount of the increases applicable to exceptional rates published in the railway companies' rate books for the carriage of merchandise by merchandise train or passenger train or other similar service.

Corresponding additions will be applicable to rates exceeding £5. In the case of rates including collection and/or delivery the table applies to the inclusive charge.

The charges for the carriage of merchandise to places in Great Britain, the Channel Islands, the Isle of Man, and to certain destinations in Northern Ireland and the Irish Free State ; and to certain Continental Ports will be increased by 5 per cent. or thereabouts,

Existing charge				Additions
Under 10d.	...	...	...	No increase
s. d.		s. d.		s. d.
0 10	and under	2 6	... ...	0 1
2 6	,,	4 2	... ...	0 2
4 2	,,	5 10	... ...	0 3
5 10	,,	7 6	... ...	0 4
7 6	,,	9 2	... ...	0 5
9 2	,,	10 10	... ...	0 6
10 10	,,	12 6	... ...	0 7
12 6	,,	14 2	... ...	0 8
14 2	,,	15 10	... ...	0 9
15 10	,,	17 6	... ...	0 10
17 6	,,	19 2	... ...	0 11
19 2	,,	20 10	... ...	1 0
20 10	,,	22 6	... ...	1 1
22 6	,,	24 2	... ...	1 2
24 2	,,	25 10	... ...	1 3
25 10	,,	27 6	... ...	1 4
27 6	,,	29 2	... ...	1 5
29 2	,,	30 10	... ...	1 6
30 10	,,	32 6	... ...	1 7
32 6	,,	34 2	... ...	1 8
34 2	,,	35 10	... ...	1 9
35 10	,,	37 6	... ...	1 10
37 6	,,	39 2	... ...	1 11
39 2	,,	40 10	... ...	2 0
40 10	,,	42 6	... ...	2 1
42 6	,,	44 2	... ...	2 2
44 2	,,	45 10	... ...	2 3
45 10	,,	47 6	... ...	2 4
47 6	,,	49 2	... ...	2 5
49 2	,,	50 10	... ...	2 6
50 10	,,	52 6	... ...	2 7
52 6	,,	54 2	... ...	2 8
54 2	,,	55 10	... ...	2 9
55 10	,,	57 6	... ...	2 10
57 6	,,	59 2	... ...	2 11
59 2	,,	60 10	... ...	3 0
60 10	,,	62 6	... ...	3 1
62 6	,,	64 2	... ...	3 2
64 2	,,	65 10	... ...	3 3
65 10	,,	67 6	... ...	3 4
67 6	,,	69 2	... ...	3 5
69 2	,,	70 10	... ...	3 6
70 10	,,	72 6	... ...	3 7
72 6	,,	74 2	... ...	3 8
74 2	,,	75 10	... ...	3 9
75 10	,,	77 6	... ...	3 10
77 6	,,	79 2	... ...	3 11
79 2	,,	80 10	... ...	4 0
80 10	,,	82 6	... ...	4 1
82 6	,,	84 2	... ...	4 2
84 2	,,	85 10	... ...	4 3
85 10	,,	87 6	... ...	4 4
87 6	,,	89 2	... ...	4 5
89 2	,,	90 10	... ...	4 6
90 10	,,	92 6	... ...	4 7
92 6	,,	94 2	... ...	4 8
94 2	,,	95 10	... ...	4 9
95 10	,,	97 6	... ...	4 10
97 6	,,	99 2	... ...	4 11
99 2	,,	100 10	... ...	5 0

and in addition by the amount of any increase required by dock authorities where the carriage charges are inclusive of dock charges.

The charges for services rendered or accommodation provided by the railway companies incidental to the carriage of merchandise will (with certain exceptions) be increased. Where the existing charge is less than 10d. the increase will not exceed ½d. ; where the charge is 10d. or over the amount to be added to the existing charge will be calculated in accordance with the table.

CHANGE IN U.S.S.R. COMMISSAR FOR RAILWAYS.—A Moscow message reports that M. Lazar Kajanovich, Commissar for Railways, has been appointed Commissar for Heavy Industries, and has been succeeded by the former Assistant Commissar for Railways, M. Alexey Bakulin. The Soviet transport system was reorganised by M. Kajanovich, and was the only industry to work to the annual production plan.

CONGO RAILWAY RESULTS.—In 1936 the Katanga Railway carried 37,193 passengers, an increase of 26 per cent. on 1935, and 1,339,813 tons of freight, an increase of 2 per cent. A dividend of 3 per cent. on the ordinary shares is being paid. Since December the traffic has increased enormously, and during the first five months of the present year 1,120,063 tons of freight were transported. The Leopoldville–Katanga–Dilolo Railway carried over the Bukama-Port Francqui line in 1936, 9,976 passengers and 136,369 tons of freight, respective increases of 3 and 2 per cent., but over the Tenke–Dilolo section, connecting with the Benguela Railway, the freight traffic increased by 36 per cent. to 65,946 tons plus 7,830 tons of railway service traffic. The number of passengers carried, 6,160, was practically the same as in 1935. Traffic on the Upper Congo–Great Lakes Railways increased by about 30 per cent. to 69,986,765 ton-km.

Railway Share Market

Home railway stocks have been unresponsive to the acceptance of the wages award by the railway unions, and as surrounding general market conditions were again dull and moderately reactionary, it is perhaps hardly surprising that somewhat lower prices ruled. Traffic receipts were rather disappointing and the aggregate increase shown for the past week was below market anticipations. Nevertheless, now the wages question is settled many market men are of the opinion that there is scope for some improvement in the junior stocks, granted that traffics are encouraging during the next few months. But as far as concerns the more immediate future, it is felt a great deal must depend on the general tone of the stock and share markets.

Following publication of the traffic figures, both Southern deferred and Great Western ordinary lost an earlier improvement. It is believed that earnings on Great Western ordinary are now running at about 4 per cent. Consequently, if receipts are reasonably satisfactory for the rest of the year, a larger dividend than the 3 per cent. paid for 1936 would no doubt be possible. As mentioned here before, however, it is suggested in some quarters that rather than raise the dividend, the directors may decide to commence adding to reserves, which for some years were drawn on in order to keep the dividend at 3 per cent. The L.M.S.R. receipts for the past week created a good impression, but the ordinary stock is lower on balance, while the junior preference stocks also failed to keep best prices. L.N.E.R. second preference was dull, a bigger rise in traffics having been looked for. The first preference was also out of favour, despite the good yield offered. Rather more attention was given to the preferred and deferred stocks, although prices showed little movement. Guaranteed and debenture stocks of the main line railways were reported to be firm. London Transport "C" was fairly steady.

Foreign railway securities were once again dull and neglected. Chief attention was probably given to those of the B.A. Gt. Southern and B.A. Western, but the amount of buying was insufficient to prevent a reactionary trend. Central Argentine issues were without features of interest. The steadiness of the 6 per cent. preference suggests hopes that the large arrears of dividend may be dealt with by a funding scheme. No dividend has been paid since July, 1932.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1936-37	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1936	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1936	Prices: Lowest 1936	Prices: Sept. 1, 1937	Prices: Yield % (See Note)
				£	£		£	£	£					
South & Central America	Antofagasta (Chili) & Bolivia	834	29.8.37	18,640	+ 6,120	35	567,850	469,080	+ 98,770	Ord. Stk.	25	15¼	20	Nil
	Argentine North Eastern	753	28.8.37	11,297	+ 1,690	9	89,604	79,427	+ 10,177	„	12	2	10½	Nil
	Argentine Transandine	—	—	—	—	—	—	—	—	A. Deb.	54	45	85	411/16
	Bolivar	174	July, 1937	5,800	— 800	30	40,800	47,600	— 6,800	6 p.c. Deb.	9	5	8½	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	16	11½	15½	3¼
	Buenos Ayres & Pacific	2,806	28.8.37	78,846	+ 4,946	9	687,345	639,854	+ 47,491	Ord. Stk.	17½	6	10½	Nil
	Buenos Ayres Central	190	14.8.37	$159,300	+ $31,600	7	$1,010,600	$796,400	+ $214,200	Mt. Deb.	31½	11	31	Nil
	Buenos Ayres Gt. Southern	5,084	28.8.37	124,318	+ 8,600	9	1,024,380	946,910	+ 77,470	Ord. Stk.	31¾	13¾	24	Nil
	Buenos Ayres Western	1,930	28.8.37	49,752	+ 8,462	9	396,713	343,901	+ 52,812	„	29¾	11	21½	Nil
	Central Argentine	3,700	28.8.37	129,984	— 14,400	9	1,195,429	1,140,677	+ 54,752	„	32 32	8¾	23	Nil
	Do.	—	—	—	—	—	—	—	—	Dfd.	21	4½	11½	Nil
	Cent. Uruguay of M. Video	980	21.8.37	14,864	— 438	8	113,062	113,734	— 672	Ord. Stk.	7¾	3	5	Nil
	Cordoba Central	1,218	28.8.37	31,950	— 6,290	9	343,190	326,520	+ 16,670	Ord. Inc.	5	1	4½	Nil
	Costa Rica	188	June, 1937	31,051	+ 4,093	52	249,333	186,880	+ 62,453	Stk.	36½	32	34	5⅞
	Dorada	70	July, 1937	15,100	— 900	30	105,500	95,300	+ 10,200	1 Mt. Db.	107	101½	104½	5¼
	Entre Rios	810	28.8.37	15,062	+ 2,769	9	122,778	104,582	+ 18,196	Ord. Stk.	17	6	11	Nil
	Great Western of Brazil	1,092	28.8.37	6,400	+ 1,000	35	248,700	259,200	— 10,500	Ord. Sh.	1/2	5/16	1/2	Nil
	International of Cl. Amer.	794	July, 1937	$420,213	+ $109,517	31	$3,625,846	$3,307,205	+ $318,641	—	—	—	—	—
	Interoceanic of Mexico	—	—	—	—	—	—	—	—	1st Pref.	1/2	-/6	1/2	Nil
	La Guaira & Caracas	22½	July, 1937	4,415	— 495	31	38,120	32,250	+ 5,870	Stk.	9	3	7½	Nil
	Leopoldina	1,918	28.8.37	27,024	+ 1,612	35	794,803	635,578	+ 159,225	Ord. Stk.	10½	3½	5	Nil
	Mexican	483	21.8.37	$299,300	+ $4,700	8	$2,142,300	$1,833,600	+ $308,700	„	1¼	1/4	1/2	Nil
	Midland of Uruguay	319	July, 1937	7,516	— 237	4	7,546	7,783	— 237	„	1½	1/8	1/2	Nil
	Nitrate	384	15.8.37	5,622	+ 2,505	32	100,988	84,113	+ 16,875	Ord. Sh.	63/6	41/9	2⅜	Nil
	Paraguay Central	274	21.8.37	$3,640,000	+ $1,084,000	8	$26,892,000	$19,747,000	+ $7,145,000	Pr. Li. Stk.	85	71	81½	7/8
	Peruvian Corporation	1,059	July, 1937	81,134	— 3,187	5	81,134	84,321	— 3,187	Pref.	15	9	10	Nil
	Salvador	100	21.8.37	¢10,127	+ ¢251	8	¢93,629	¢81,499	+ ¢12,130	Pr. Li.Db.	18	16	22½	Nil
	San Paulo	153½	22.8.37	37,406	+ 8,425	34	1,113,691	1,003,997	+ 109,694	Ord. Stk.	86	46½	84½	5 15/16
	Taltal	160	July, 1937	2,940	+ 415	4	2,940	2,525	+ 415	Ord. Sh.	11 5/32	14/-	11⅜	8⅞
	United of Havana	1,353	28.8.37	17,638	+ 460	9	160,756	139,091	+ 21,665	Ord. Stk.	3¼	1	3	Nil
	Uruguay Northern	73	July, 1937	766	— 139	4	766	905	— 139	Deb. Stk.	5	3	8	Nil
Canada	Canadian National	23,766	21.8.37	733,614	+ 22,531	34	24,484,093	22,167,197	+ 2,316,896	—	—	—	—	—
	Canadian Northern	—	—	—	—	—	—	—	—4 p.c.	Perp. Dbs.	76	51	68	5⅝
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	104¾	99¾	101½	3 15/16
	Canadian Pacific	17,228	21.8.37	512,400	— 8,000	34	17,311,000	16,204,000	+ 1,107,000	Ord. Stk.	16¾	10 15/16	11½	Nil
India†	Assam Bengal	1,329	10.8.37	33,660	+ 4,739	19	471,822	437,535	+ 34,287	Ord. Stk.	87¾	82¼	77½	3⅞
	Barsi Light	202	31.7.37	3,240	+ 735	18	49,740	44,850	+ 4,890	Ord. Sh.	77½	65½	48	10 7/16
	Bengal & North Western	2,111	10.8.37	69,347	+ 9,631	19	1,123,946	1,014,053	+ 109,893	Ord. Stk.	319	292⅝	308	5⅞
	Bengal Dooars & Extension	161	10.8.37	4,067	+ 603	19	46,960	44,358	+ 2,602	„	12 7½	118	91½	6
	Bengal-Nagpur	3,268	10.8.37	151,500	+ 13,386	19	2,550,584	2,255,040	+ 295,544	„	104	100¼	90½	4 7/16
	Bombay, Baroda & Cl. India	3,072	20.8.37	200,100	+ 21,675	20	3,507,525	3,255,150	+ 252,375	„	114	110½	111½	5⅜
	Madras & Southern Mahratta	3,229	10.8.37	126,375	— 5,490	19	2,094,958	2,083,667	+ 11,291	„	11 6½	108½	108½	7⅜
	Rohilkund & Kumaon	546	10.8.37	10,176	— 125	19	212,516	206,085	+ 6,431	„	311	286	310	5 15/16
	South Indian	2,531½	31.7.37	114,161	+ 6,147	18	1,405,810	1,371,967	+ 33,843	„	10 7½	102 5/16	101½	5 7/16
Various	Beira-Umtali	204	June, 1937	91,505	+ 27,313	40	676,896	577,342	+ 99,554	—	—	—	—	—
	Egyptian Delta	620	31.7.37	7,258	+ 745	16	76,566	70,137	+ 6,429	Prf. Sh.	21¼	16⅜	15⅜	Nil
	Great Southern of Spain	—	—	—	—	—	—	—	—	Inc. Deb.	11½	1/8	31½	Nil
	Kenya & Uganda	1,625	May, 1937	216,935	— 20,539	22	1,334,126	1,229,899	+ 104,227	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	50½	37	46	7⅝
	Midland of W. Australia	277	June, 1937	10,968	— 993	52	155,208	161,372	— 6,164	Inc. Deb.	97	93½	95	4 5/16
	Nigerian	1,900	10.7.37	28,485	+ 2,327	15	790,600	430,129	+ 360,471	—	—	—	—	—
	Rhodesia	2,451	June, 1937	419,881	+ 130,017	40	3,352,058	2,584,870	+ 767,188	—	—	—	—	—
	South Africa	13,263	7.8.37	607,086	+ 15,407	19	11,602,692	10,875,891	+ 726,801	—	—	—	—	—
	Victoria	4,774	Apr., 1937	885,120	+ 97,538	43	8,519,136	8,206,520	+ 312,616	—	—	—	—	—
	Zafra & Huelva	112	June, 1937	10,643	+ 1,375	26	80,860	57,843	+ 23,017	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16.

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador and Paraguay Central receipts are in currency.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements are based on the current rates of exchange and not on the par value.

Diesel Railway Traction

American Diesel Train Costs

ACCORDING to Mr. E. Wanamaker, Electrical Engineer of the Chicago, Rock Island & Pacific Railroad, the average diesel railcar of 250 to 500 b.h.p. hauling a train of ordinary cars in the U.S.A. operates at a total overall cost of 30 to 40 cents a mile; similar trains of 500 to 800 b.h.p. cost 40 to 60 cents a mile, the daily mileage being comparatively low. The high-speed lightweight trains, making a considerable daily and annual mileage, up to 270,000 miles a year and up to 2,500 miles in a continuous run, cost 30 to 50 cents a mile for the 600 to 1,200 b.h.p. sizes, and from 60 to 160 cents a mile for the 1,500 to 5,400 b.h.p. trains. The last value is that estimated for the new 5,400 b.h.p. 17-car train which is not yet in regular service. It is generally understood that after allowing 15 per cent. for depreciation and obsolescence on top of the normal operating charges, there is a handsome return from the investment cost of these trains, which varies from £50,000 for a three or four-car stainless steel train of 660 b.h.p. to £300,000 for a 17-car *de luxe* air-conditioned train of 5,400 b.h.p. The availability of all the types in use now averages over 95 per cent. Light repairs are required usually after 125,000 miles (say, after six or seven months with the usual Zephyr services), and a heavier repair including traction motor overhauls at 250,000 miles. Another light repair is given at 375,000 miles and a thorough general repair at 500,000 miles, or after two to two and a half years' operation.

Engine Life and Maintenance Cost

FEARS still appear to be prevalent in certain quarters that the high-speed oil engine as used in railcars is going to have a very short life, through excessive wear and tear, although in more enlightened circles it has sometimes been given a life of ten years, by which time, opinion considered, it would be obsolete. It is strange how entirely different criteria are applied to the respective lives of steam locomotives and oil engines. It is but a little time since a responsible railway officer gravely stated in public that the life of a steam locomotive was 40 years, without giving anything away as to how many rebuildings, reboilerings, re-tubings, new tyres, new motion pins, or even new frames it was given in those four decades. Nor did it appear to strike him that with the application of similar principles the life of an oil engine would be just as long. Indeed one of the British railways actually has had a diesel engine in service for over 30 years, and although its design might have been considered obsolete even in pre-war days, it has not been thought necessary to replace it, and it was still at work the last time we were along the Border. Experience of 12 consecutive years of running on the Canadian National Railways with lightweight Beardmore engines indicates that a life of 20 years for such equipment should be considered as conservative. And, just as important, that experience has shown that the engines have not become obsolete, nor do they suffer from rising maintenance costs and fuel consumption with increasing age. In fact, the opposite is the case, for with constantly improving methods of inspection and repair, sundry modifications of a detail character, and the increasing familiarity of the staff with all the components and their behaviour, the servicing cost is going down.

The Railcar in India

ALTHOUGH the Wedgwood Committee was not particularly enthusiastic in the recommendations relating to railcars contained in its report on Indian railways, the tremendous possibilities of these vehicles on both broad and narrow gauge systems in India are receiving a good deal of attention, and there is plenty of evidence that a fairly large-scale use is not far off, due mainly to the characteristics of railcars in combating road interests. In this direction, the experience of the G.I.P.R. on the Pulgaon—Arvi branch with the diesel-electric vehicle described in the issue of this Supplement for May 14 has been most encouraging. On the South Indian Railway, following satisfactory results with the small and simple car described in our issue for April 17, 1936, four broad-gauge and four metre-gauge diesel railcars are to be obtained, for operation specifically on lines where road transport has proved a menace. The recent budget considered by the Standing Finance Committee for Railways, contained requests from three lines for railcars to recapture short distance passenger traffic lost to the roads, and cognisance was given to the fact that railcars can be run profitably on short and fast trips with small paying loads. Among the railways which already have considered in great detail the adoption of railcars are the North Western, the Eastern Bengal, and the B.B.C.I., and all have submitted proposals for the inclusion of a number of railcars in the rolling stock programme for 1938-39. The North Western desires a dozen broad-gauge cars, and estimates the cost at Rs. 13 lakhs. The B.B.C.I.R. proposes to purchase two twin vehicles for broad-gauge lines, and has allowed Rs. 3 lakhs for the purpose. The Eastern Bengal requisition is for eight broad and four metre-gauge cars at a cost of Rs. 10·8 lakhs, and the programme of this line is of especial interest in view of the propositions put forward from time to time for the introduction of diesel trains to provide an accelerated and more frequent service on the suburban route from Sealdah to Budge-Budge. The Madras & Southern Mahratta Railway has had in service for over two years six broad-gauge diesel-electric cars, and these vehicles have always been considered as a counter-measure to road competition. How seriously the adoption of railcars is being treated may be gauged by the attention given to certain problems at the recent annual conference of chief engineers held at Simla. Believing that it will be in the vicinity of large towns that fast and frequent railcar services will be desired, special attention is to be given to fencing and level crossing protection, and it would appear that only as this is done will the full accelerative and speed capacities of railcars be utilised.

The Work of the L.M.S.R. Diesel-Electric Shunters

Arduous service undertaken on large scale at Crewe South

THE operation of the 20 L.M.S.R. diesel-electric shunting locomotives of 350 b.h.p. described fully in the issues of this Supplement for March 20 and April 17, 1936, has been concentrated mainly at Crewe and Willesden. Five of the English Electric locomotives are at the latter place and five English Electric and five Armstrong-Whitworth locomotives at Crewe. In addition, Crewe has the original English Electric demonstration locomotive while the Armstrong-Whitworth 250 b.h.p. shunter, which has been at work since February, 1934, is at Brent sidings, near Willesden. The remaining five Armstrong-Whitworth locomotives are at Carlisle.

With the exception of the English Electric original locomotive, which is at the north end of Crewe warehouse, the Crewe locomotives are divided between the Basford Hall up and down sidings, Gresty Lane sidings, and North Staffordshire sidings, and here, through the good offices of Mr. W. A. Stanier, the Chief Mechanical Engineer, and his Chief Technical Assistant, Mr. T. Hornbuckle, and the courtesy of Mr. C. R. Byrom, the Chief Operating Manager, and Mr. D. C. Urie, the Superintendent of Motive Power, we recently had the opportunity of observing the various locomotives at work.

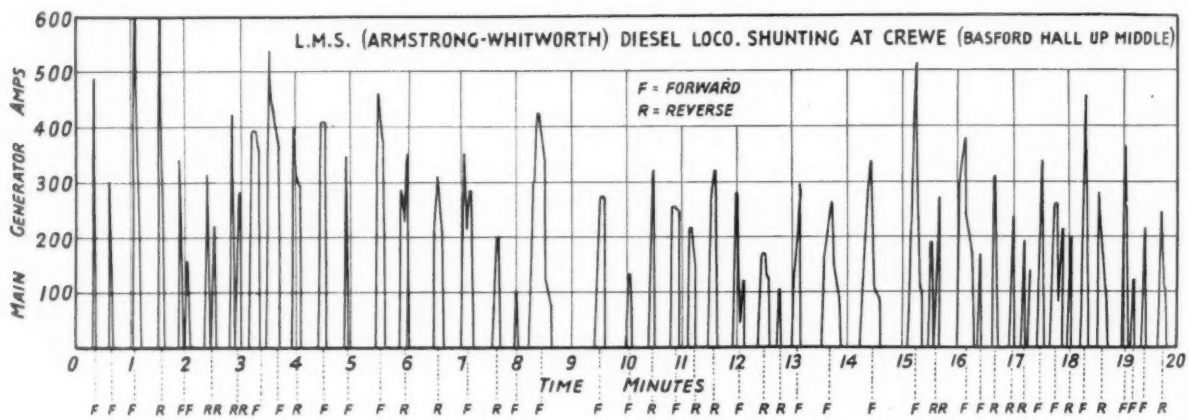


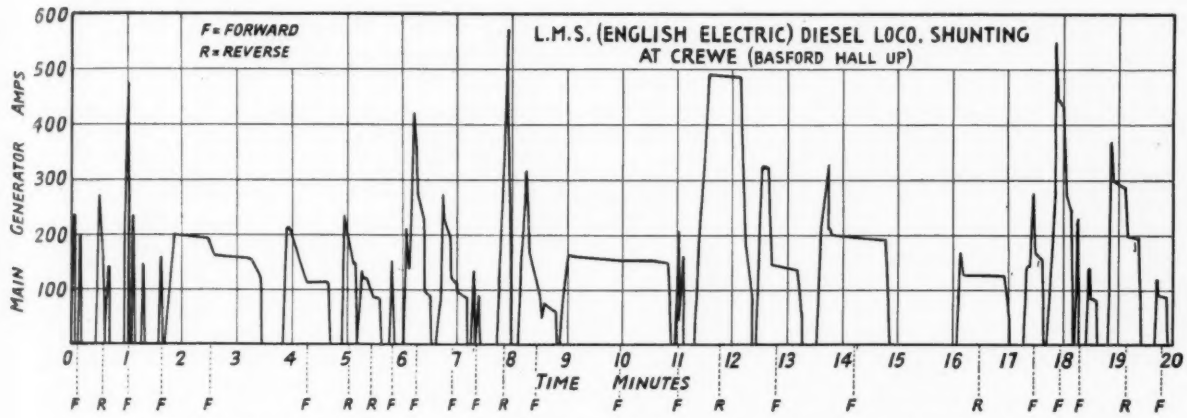
Fig. 1—Operation of a single-motor 350/400 b.h.p. oil-electric locomotive in arduous breaking-up service

Normally, each locomotive works 24 hr. a day for six days a week, and, with the driving shifts, is changed round every three weeks from one set of sidings to another. This not only gives the drivers wider experience, but results in each locomotive performing approximately equal duties, for the type of operation required in the different sidings is amazingly different. The difference can be seen at a glance by comparing the two charts, Figs. 1 and 2, drawn up from observations which we made, the first at sidings breaking up goods trains arriving from the south and the second at sidings where up goods trains were being marshalled. There is no hump shunting at Crewe.

Over a normal week's work the fuel consumption of these 51-ton 350 b.h.p. locomotives averages 250 to 300 gal., and the actual mileage varies from 160 to 205 according to the particular siding. The locomotives are stabled at Crewe South shed and fuel oil is brought there in ordinary tank wagons, from which it is forced by compressed air into two horizontal cylindrical storage tanks each with a capacity of 3,000 gal. which provide nearly twice the total average weekly fuel consumption. From these stationary tanks the fuel is blown into the locomotive tanks by compressed air at a pressure of 7 lb. per sq. in. supplied either by a separate air compressor on the locomotive or by an auxiliary air compressor fixed near the storage tanks, and about 350 gal. can be loaded in 8 min. There is no filter on the stationary tanks, but there is one adjacent to the connection on the locomotive through which the fuel must pass before reaching the locomotive tanks. Each engine is brought to the motive power depot once a week for examination and refuelling.

At Basford Hall down sidings these engines are employed in splitting up loose-coupled arriving trains of from 50 to 70 wagons and in making up similar trains for departure in adjacent marshalling sidings. The average time taken to dispose of an incoming train is approximately 45 min. and the work both of breaking up incoming trains and marshalling outgoing trains can be carried out as speedily by the diesel engines as by the standard steam shunting tank engines. The actual speed of movement of the diesels in bad weather is more rapid than that of the steam shunting engines, because of the absence of slipping. In addition, the diesel locomotives provide a greater regularity of acceleration than the steam shunting engines, which results in less violent buffering up and in a more regular drawbar pull being obtained. This tends to reduce the risk of damage caused by shunting both to the rolling stock and to the contents of the wagons.

From Fig. 1 it will be seen that what is required of locomotives breaking up trains is a rapid succession of kicks of the shortest duration, with which are mingled a certain number of the longer pushes, the whole throwing a rapidly fluctuating load upon the engine and transmission although rarely up to the maximum capacity of the equipment. This sequence is virtually continuous, and during an hour on the footplate in these particular sidings we noticed only two stops of more than one minute's duration. The peaks of the main generator



F.g. 2—Operation of a two-motor 350 b.h.p. oil-electric locomotive in marshalling service

current reached 650 amp. when pushing 48 wagons and 400 amp. with 30 wagons. Starting alone or with up to half-a-dozen wagons the current recorded was 200 amp., and this sufficed also for the propulsion at 6 to 8 m.p.h. of 6 to 10 empty wagons. An unusual operation on this target was a period of 1 min. 57 sec. moving at a steady speed of 1·5 m.p.h. and at a steady generator current of 390-400 amp., and propelling 32 loaded wagons. The fact that a greater and greater proportion of the load came on to a curve appeared to have no effect on the power output required at this low speed.

The Armstrong-Whitworth locomotives on this duty maintained a steady cooling water temperature of about 150 deg. F., and a cooled oil temperature of 95 deg. F. Coming out from the shed the water temperature was approximately 120 deg. F. but rose to 140 deg. F. within a quarter of an hour and then more slowly to 150 deg. F. When a temperature of 160 deg. F. is reached a thermostat cuts out part of the radiator, but the usual feature is over-cooling rather than under-cooling, despite the provision of shutters over a portion of the radiator. Starting from the shed the lubricating oil pressure in the main bearings was 16 lb. per sq. in., and on the normal duties rarely exceeded 25 lb. per sq. in. The fittings on the dashboard and weatherboard include a battery ammeter (charge and discharge); main generator ammeter; brake gauges; lubricating oil pressure and temperature gauges; cooling water temperature gauges; and a recording speedometer. Fortunately the driver does not need to keep his eye on all of these, and can devote practically all his time to traffic department requirements.

Marshalling Contrasted with Breaking-up

As will be noted from Fig. 2 the work required from the locomotive in marshalling operations was of a totally different character, the usual maximum amperage being less, but much longer sustained, than when breaking up. The speed, too, frequently rose to 6-8 m.p.h. sustained, whereas momentary peaks of 5 to 6 m.p.h. were all that were attained in breaking up. But the marshalling work was just as heavy, and during 55 min. on the footplate we noted only one stop (1 min. 15 sec.) in excess of 20 sec. The current peaks rose to 600 amp., but values of 480-600 amp. were maintained for 50 to 60 sec. and 150-180 amp. for 100-120 sec.

On the day of our visit one of the English Electric locomotives (among others) was engaged on this turn, and maintained steadily a cooling water temperature of 154-155 deg. F. These engines have the same cooling and thermostatic arrangements as in the Armstrong-Whitworth machines. The cooling oil temperature at the outlet was 133-135 deg. F., and the pressure (by gauge) only 12-15 lb. per sq. in.

After approximately 10,000 miles each locomotive is considered for heavy overhaul. This mileage, corresponding to 6,600 hr. of service, is just being reached by the first units to go into traffic. Experience indicates that the period between inspection and repairs originally fixed in consultation with the makers can be extended, and differences in these periods for the two types largely eliminated.

FRENCH TOURIST RAILCAR.—The Northern Railway of France has ordered an observation railcar with glass all round, which is to be powered by a horizontal two-stroke engine of 250 b.h.p.

DIESEL FOR PANAMA.—The United Fruit Company has ordered a 200 b.h.p. diesel-electric locomotive from the American Locomotive Company for its lines in Panama. This company has had other diesel locomotives in service for some years.

PRODUCER-GAS CARS IN FRANCE.—The first of the three De Dietrich producer-gas railcars with Panhard engines and gas generators, and the Mylius type of mechanical transmission, has been completed. The engine is of the 12-cylinder vee type with a maximum output of 280 b.h.p.

SUBURBAN DIESELS IN U.S.A. — One of the American railroads is studying the possibility of applying diesel-electric railcars formed into multiple unit sets to an outer suburban service with an average length of run of 20 miles. It is proposed that each car should have an output of 700 b.h.p., and the rebuilding of 100 existing carriages is contemplated. When built, these carriages were designed to take electric traction motors, as electrification was then envisaged for a future date.

CRANKSHAFT HARDENING.—Another process of surface-hardening such parts as crankshafts and camshafts has been introduced, by the Ajax Electrothermic Corporation, in the U.S.A. The method used is that of electrical induction, followed by water-jet hardening to a Brinell number of about 600.

D.E.U.A. PROGRAMME. — The meetings and papers arranged for the 1937-38 session by the Diesel Engine Users Association include a paper on the design of elastically-supported foundations for reciprocating engines (October 21); another on supercharging (February 10, 1938); and an informal discussion on bearing metals (March 10, 1938).

CANADIAN NATIONAL RAILCAR EXPERIENCE

RESULTS obtained during well over 10,000,000 miles of diesel railcar operation were summarised recently in a paper presented before the American Society of Mechanical Engineers by Mr. I. Sylvester, of the Canadian National Railways. Broadly, the paper was on similar lines to that valuable contribution made to the August 14, 1934, issue of this Supplement by Mr. R. G. Gage, Chief Electrical Engineer of the C.N.R., but contained additional interesting notes as to the exact wear on various constituents, and an account of the latest repair and maintenance methods.

It will be remembered that the Canadian National began diesel railcar operation in 1925 with Beardmore-engined cars, and in the subsequent four years acquired further units with Beardmore and Westinghouse-Beardmore engines. There are 28 cars in service, but the operating data given by Mr. Sylvester refers to the 26 cars varying

DIESEL RAILCARS, CANADIAN NATIONAL RAILWAYS

Car No.	Engine	B.H.P.	Length of car	No. of seats	Baggage space	Weight
			Ft.			Tons
15817–15818	Beardmore 8 cyl.	400	102	126	Yes	85·7
15819–15825, 15831	Beardmore 4 cyl.	200	60	57	Yes	48·0
15826–15830	Beardmore 6 cyl.	300	73	57	*	63·0
15832–15840	Westinghouse-Beardmore 6 cyl.	350	73			63·5
15841–15844	Westinghouse-Beardmore 6 cyl.	300	73			63·0

* Some cars have baggage compartment, and one car is for baggage and mails only

from 200 to 350 b.h.p., and does not take account of the two articulated cars of 400 b.h.p. Mileages of over 300 a day and 76,000 a year were made at one time, but with the reorganisation of passenger services during the last two or three years, the mileage has not been quite so great. The main characteristics of the 28 vehicles are given in the accompanying table.

Maintenance and Repair Features

One example of modern methods is to be found in the now rather extensive use of welding and chromium-plating as a means for re-conditioning wearing parts. Fusion welding is being used for oil engine repairs, and progress has been made in the use of electric and acetylene flame for the building up of worn parts and the repair of fractures. In certain cases heat-treatment had to be given after the welding or building up, in order to regain certain physical properties. Some ingenuity was required to develop a successful welding technique for such oil engine parts as cylinder liners, pistons, and valve and rocker gear, but this, and the selection of satisfactory welding rods, having been achieved, it has enabled a reduction in maintenance charges to be effected.

Investigations have been made into the possibilities of hard chromium-plating as a means of reducing wear on certain parts, and as a means of regaining the original size of worn constituents. Worn surfaces on crankshafts, gudgeon pins, cylinder liners, pins, journals and other small parts have been built up satisfactorily with chromium. This type of plating has little in common with the decorative form of chromium-plating, for it is applied direct to the base metal in thicknesses of 0·003 to 0·015 in., depending on the actual service conditions. Excessively thick linings have not been found desirable, and therefore the original sizes are not always regained. Although tough and adherent enough, this chromium lining will not always endure very high unit pressures or shock, and in a Brinell test the high-pressure load of the ball in making the impression will crack the chromium-plating, and the reading will be practically equivalent to that of the base metal beneath. Readings were taken with a Firth diamond tester, which makes a small impression on the plate and is not affected by the hardness of the metal beneath; when these readings were converted to the Brinell scale they ranged from 650 to 900. If finishing is carried out carefully, a hard, low-friction wear-resisting surface is produced.

Steel cylinder liners have been re-conditioned by electrically-welding a band of metal on the worn portions of the walls, and then boring and grinding to size. Chromium-plated and nitrided steel liners are being tried also, and the use of cast-iron liners in place of the original steel units has been investigated, but there has been some difficulty in applying liners of this metal within the confined space available in the cylinder block. Trial liners of nitralloy steel have shown only one-quarter to one-fifth the wear of mild-steel liners, taken over a mileage of 260,000. Pitting of the steel liners due to the action of the cooling water on the outside has been experienced with the steel liners but not with nitrided or cast-iron types.

Comparisons have been made between the wear-resisting properties of carbon, nickel and nickel-chrome steels when used for engine crankshafts, and it was found that there was little difference between them, but the tendency since has been to use the alloy types because of the harder bearing surfaces and greater strength. An interesting experience is that the main journals show a wear of 0·001 to 0·002 in. per 100,000 miles, whereas the crankpins generally show a wear of 0·006 to 0·009 in. in the same mileage. The nitralloy trial crankshafts, which have been in service three or four years, show much less actual wear, but whatever the type of steel the crankpin wear always is four to five times that found on the main journals. The gudgeon pins, of the fully-floating type, have given no trouble, and even after many years' operation the maximum wear found was only 0·006 in. Piston wear gave some trouble, but after a thoroughly suitable fuel had been found, and narrower but thicker rings were installed, there was an improvement.

THE SLOVAK ARROW.—Just over a year ago the Czechoslovak State Railways inaugurated a new railcar service between Prague and Bratislava with two petrol-engined railcars, which supplemented the older diesel-worked "Blue Arrow" service. The schedule speed over the 247 miles between the two cities named above is 51 m.p.h., and since the inauguration the service, known as the "Slovak Arrow," has been carried on by the two original cars, built by Tatra and powered by two 165 b.h.p. engnes driving through electro-mechanical transmission. The fuel consumption is about 1.75 lb. per mile.

EXTENSION IN BRAZIL.—Speaking in public recently Col. Mendonça Lima, the general manager of the Central Railway of Brazil, intimated that a large-scale introduction of diesel traction was under consideration on his line. In particular, the acquisition of at least 30 diesel-electric locomotives capable of hauling 1,000-ton mineral and freight trains was contemplated. Further, the introduction of modern diesel-electric trains was proposed in order to improve the speed and conditions of travel in the interior, more particularly to São Paulo and Bello Horizonte.

RAILCAR OIL ENGINES

A continuation of our summary of the world's leading makes

IN the last instalment of this article were described British oil engines which have been used in railcars. The present instalment covers the engines made by German concerns and their licensees in other countries. There are about a dozen makers in Germany regularly supplying oil engines for railway work; others, such as Henschel, have engines used in powerful road vehicles which are suitable for railcar work although not used in that field up to the moment, and in addition there are firms like Kamper whose engines have been used in road vehicles and for small shunting locomotives.

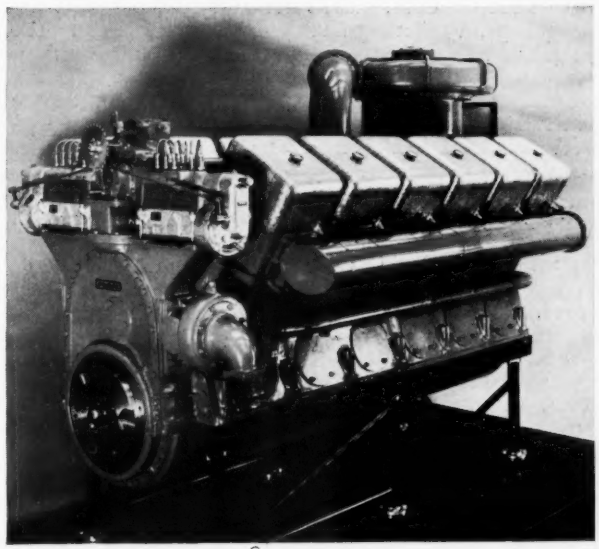
M.A.N.

Probably no firm in the world has such a variety of railway oil engines as the Maschinenfabrik Augsburg-Nürnberg, ranging from 65 to 2,200 b.h.p., and of almost every conceivable speed, weight and cylinder arrangement. A number of the types in service are considered as obsolete for new construction and need not be mentioned here, and, of course, the purely locomotive engines (600, 900, 1,200, and 2,000 b.h.p., &c.) are beyond the engines, with their principal characteristics, is shown in the accompanying table. Although direct injection was used exclusively by M.A.N. for years, many of the models up to 250 b.h.p. now incorporate a pre-combustion chamber.

TYPICAL M.A.N. RAILCAR ENGINES

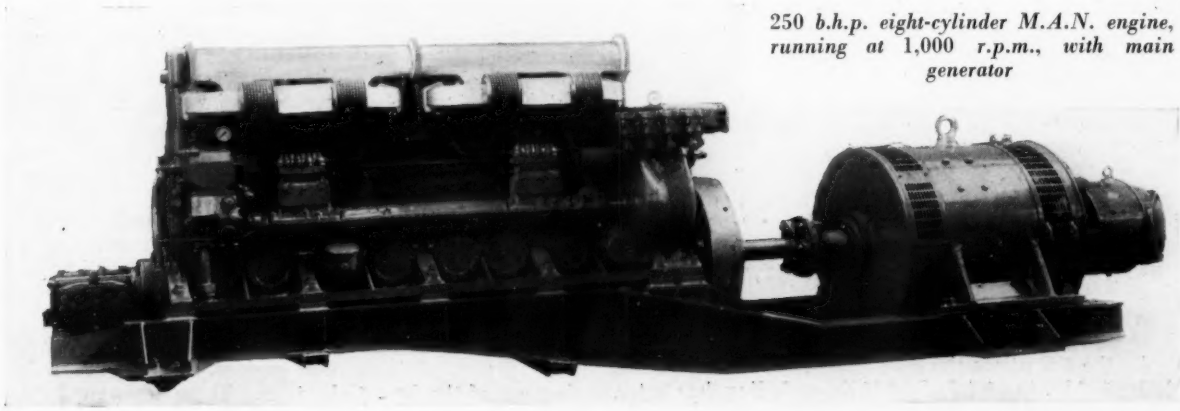
Type	B.H.P.	No. of Cyl.	Cyl. Bore and Stroke Mm.	Speed R.p.m.	Cylinder arrangement	Remarks
W6V 15/18 ..	150/165	6	150 × 180	1,500	Vertical	—
W6V 17.5/22 ..	170/190	6	175 × 220	900/1,000	,,	—
L6V 17.5/18 ..	210/225	6	175 × 180	1,400/1,500	,,	—
W8V 17.5/22 ..	225/250	8	175 × 220	900/1,000	,,	Same engine speed increased.
W8V 17.5/22 ..	250/290	8	175 × 220	1,000/1,200	,,	Same engine speed increased.
L8V 17.5/18 ..	280/300	8	175 × 180	1,400/1,500	,,	—
W6V 22/30 ..	360/400	6	220 × 300	900/1,000	,,	—
L12V	420	12	175 × 180	1,400	Vee	—
W12V 22/30 ..	275	12	130 × 190	1,500	Horizontally opposed	—
W6V 15/18 (A)	200	6	150 × 180	1,500	Vertical	Supercharged
L8V 17.5/18 (A)	350	8	175 × 180	1,500	,,	,,
W6V 22/30 (A)	560 (max.)	6	220 × 300	1,000	,,	,,
L12V (A) ..	560	12	175 × 180	1,400	Vee	,,
W8V 30/38 ..	1,300	8	300 × 380	700	Vertical	,,

Where single values are given in the B.H.P. column they refer to the continuous output. Where two values are given, the first is the continuous output.



560 b.h.p. supercharged M.A.N. engine developed from the standard 420 b.h.p. non-supercharged unit

The WV low and medium power engines are used in a large number of countries. They are totally enclosed and have an integral crankcrase and cylinder block of cast iron with cast-iron wet-type cylinder liners inserted, and are provided with large inspection doors in the sides. Usually the sump is of semi-circular section. Apart from the WV 15/18 models, the cast-iron cylinder heads are cast separately, but the casings for them are arranged in pairs. The heads contain a pre-combustion chamber with Bosch injection nozzle and a starting plug. There is one inlet and one exhaust valve per cylinder, driven



250 b.h.p. eight-cylinder M.A.N. engine, running at 1,000 r.p.m., with main generator

from a camshaft located high up the crankcase, and gear-driven from the main shaft. Light metal pistons are used and they drive through alloy steel connecting rods an alloy steel crankshaft, hollow-bored through the shaft and pins, but without balancing by the prolongation of the crankwebs. Bosch fuel pumps and Bosch starting motors are standard. The forced lubrication system has two pumps, a collecting tank and an outside cooler. The weight in this range varies from 28 to 15 lb. per b.h.p. according to the size and age of the engine; the LV range (see table) scale about 15 lb. per b.h.p. on the continuous rating, and as general practice have welded steel crankcases and cylinder blocks. The standard rotational speed of this type is 1,500 r.p.m.

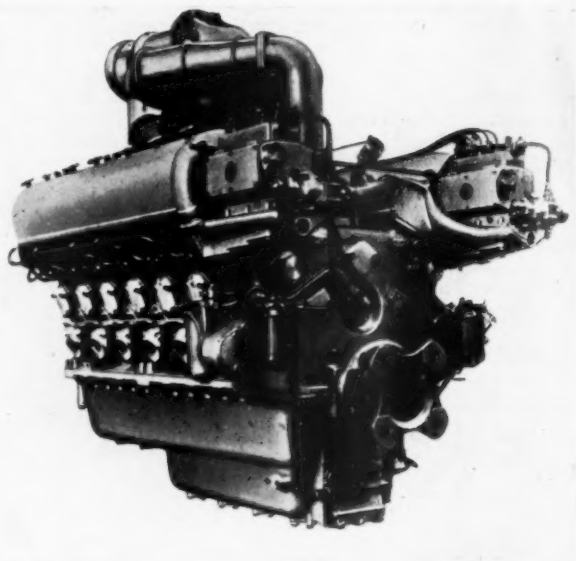
Although M.A.N. has a successful 12-cylinder vee engine developing 420 b.h.p. at 1,400 r.p.m. (which superseded a twin-crankshaft engine of the same cylinder dimensions, output and speed), it appears as if efforts are being made to use fewer and larger cylinders and run at a reduced speed. Two typical examples of this form of construction are the W6V 22/30 engine developing a maximum of 400 b.h.p. at 1,000 r.p.m. and the new W8V 30/38 engine being installed in the new *schnelltriebwagen* of the Reichsbahn, which develops 1,300 b.h.p. at 700 r.p.m. with supercharger in operation. The 400 b.h.p. engine has a maximum output of 560 b.h.p. when fitted with a supercharger; it has two inlet and two exhaust valves per cylinder. The crankshaft is carried on seven plain bearings, and is of chrome-molybdenum steel with the main and crankpin journals hardened by the Doppel-Duro process. The pistons are of light metal and the crankcase of cast iron. An illustration of this engine was published on page 79 of the issue of this Supplement for July 10, 1936. The supercharged 1,300 b.h.p. engine weighs 17 lb. per b.h.p.; it has M.A.N. fuel pumps and nozzles, contrasting with the Bosch units on the 400 b.h.p. engine, and the crankcase and cylinder block are a combination of cast iron and welded steel plate construction.

Welded steel construction was a feature of the twin-crankshaft 420 b.h.p. vee engine, but cast iron is used for the succeeding single-crankshaft engine, which has pre-combustion chamber cylinder heads compared with the direct injection of the twin-crankshaft engines, and Bosch fuel pumps and injection nozzles against M.A.N. constituents. Supercharging is becoming a feature of M.A.N. practice from 200 b.h.p. upwards, all the applications using the Büchi or Rateau turbo-blower systems. The increment in power on the continuous rating varies from 25 to 45 per cent., and the full load fuel consumption drops from a general figure of *circa* 0·42 lb. per b.h.p. hr. to 0·365 or 0·375 lb.

Maybach

In contradistinction to M.A.N., the Maybach Motorenbau has only three basic designs, of 175, 210 and 410 b.h.p., any of which may be supercharged, giving a further range of 225, 275 and 600 b.h.p. Supercharged or not, all these engines run at 1,400 r.p.m. The 175 b.h.p. engine was developed from the old 150 b.h.p. model dating from 1924, and the 410 b.h.p. size has undergone some modifications in the last two years, including an increase of 10 mm. in the cylinder bore, the provision of a balanced crankshaft, and alterations to the piston material and injection details, the side injection being given up in favour of central injection through four nozzle holes.

The present 410 b.h.p. vee engine has 12 cylinders with a bore and stroke of 160 mm. by 200 mm. respectively. Despite the alterations the total weight has been increased only by 155 lb. to a total of 4,625 lb. excluding the starter, or 11·8 lb. per b.h.p. on the continuous rating. Idling speed is 800 r.p.m., and frequently the control is arranged to give loading speeds of 950, 1,150 and 1,400 r.p.m. The injection is direct, through Deckel fuel pumps and injection nozzles, and the fuel consumption at full load and speed is 0·408 lb. per b.h.p. hr. and about 0·42 lb. at half load. The pistons are of aluminium alloy, and both the nickel-chrome steel connecting rods and crankshaft have roller bearings. The crankcase is of aluminium alloy and is carried right up to the cylinder heads, the six cylinders and heads of each bank being cast in one piece, of special iron. This Maybach G056 model has a maximum capacity of 450 b.h.p., but several engines are running with a Büchi supercharger fitted, the continuous output being 600 b.h.p. at the same rotational speed.



Maybach 12-cylinder supercharged engine developing 600 b.h.p. at 1,400 r.p.m.

With supercharger this engine, classified as G06 in the Maybach list, weighs 5,300 lb., or 8·85 lb. per b.h.p., but the full load fuel consumption of 0·395 lb. per b.h.p. hr. is somewhat high for a supercharged engine, although the consumption curve is very flat, being only 0·403 lb. at half load.

Six cylinders, 140 mm. by 180 mm., are used in the 175 b.h.p. engine, which turns normally at 1,400 r.p.m. and weighs 2,450 lb., equivalent to 14 lb. per b.h.p. The 210 b.h.p. model has cylinders the same size as those of the old 410 b.h.p. engine, viz., 150 mm. bore by 200 mm. stroke, and is, indeed, simply one bank of that vee engine with the necessary changes to the crankcase and other details; it weighs 2,650 lb., or 12·6 lb. per b.h.p. Both types have roller bearing big-ends and crankshaft bearings, aluminium alloy pistons, nickel-chrome-tungsten steel crankshafts, and the unusual type of crankcase and cylinder block construction used in the 410 b.h.p. engine. The great majority of the 500-odd Maybach engines in railway service are used in conjunction with bogie mounting, the most notable exceptions being those on the Dutch triple-car trains.

Deutz

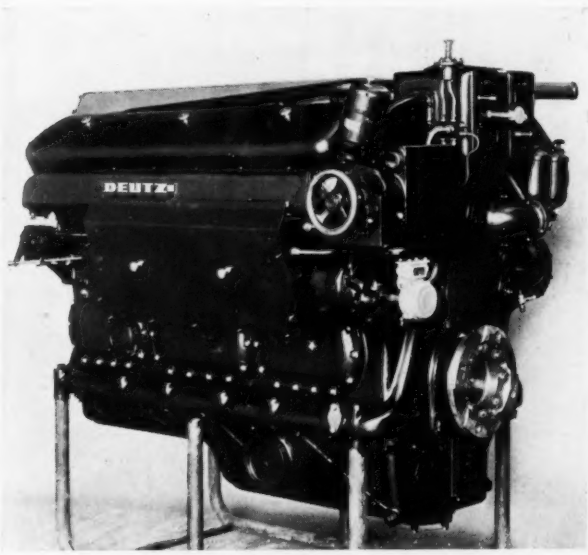
The name of Deutz is connected intimately with the development of two-stroke engines, but all the railcar sizes are of the four-stroke type. There are seven models

with four, six, or eight vertical cylinders covering the range of 50 to 150 b.h.p.; three designs, not all of which have yet been used, of 200 to 335 b.h.p.; and then the 360 b.h.p. 12-cylinder vee engine, which can be supercharged up to 500 b.h.p. or so. In addition, there is the Reichsbahn's standard horizontal engine, but this is dealt with later. The Deutz engine in its smaller sizes is used widely by the small German private railways, and in Spain, Luxembourg and elsewhere.

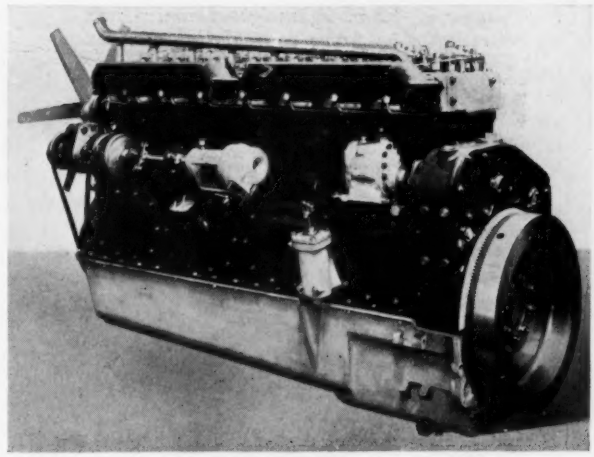
The FM series is built with three cylinder sizes, 100 mm. by 130 mm., 100 mm. by 160 mm., and 120 mm. by 170 mm., up to 150 b.h.p. The two ranges with the smaller cylinders have a normal speed of 2,000 r.p.m. and are used only up to 95 b.h.p.; the bigger-cylindered range runs at 1,500 r.p.m. Silumin crankcases are used for the two smaller types and cast iron for the largest. In both types the crankcase and cylinder block are cast integrally, and have cast-iron wet-type cylinder liners inserted. The cast-iron cylinder heads are separate and in addition to one inlet and one exhaust valve contain a pre-combustion chamber. The light-metal pistons carry three pressure and two scraper rings and drive the nickel steel connecting rods through fully-floating gudgeon pins. A friction type vibration damper is fitted at the forward end of the crankshaft of the six and eight-cylinder engines. Deutz fuel pumps and injection nozzles are used.

Next larger in the Deutz range is the AM series, comprising a 200 b.h.p. six-cylinder engine running at 1,200 r.p.m.; a 280 b.h.p. six-cylinder engine running at 1,000 r.p.m.; and an eight-cylinder unit of 335 b.h.p. running at 900 r.p.m. All the above powers are at a one-hour rating, and the unit weight is 23 to 30 lb. per b.h.p. compared with 14 to 17 lb. for the FM type of engine. This type is used also for diesel shunting locomotives.

The 360 b.h.p. vee engine has 12 cylinders 150 mm. by 200 mm. arranged in two banks with an angle of 60 deg. between them, and the above continuous output is developed at a speed of 1,400 r.p.m. on a weight of 15·3 lb. per b.h.p. The crankcase and double cylinder block are cast in one piece, of light-metal alloy, and have cast-on seats for the fuel pump, water pump, oil filter, &c. The cylinder heads contain the usual Deutz pre-combustion chamber and are cast separately; the cylinder liners are centred in the heads and secured by special



12-cylinder 360 b.h.p. Deutz engine for use in large railcars or set trains



Eight-cylinder 150 b.h.p. Deutz engine

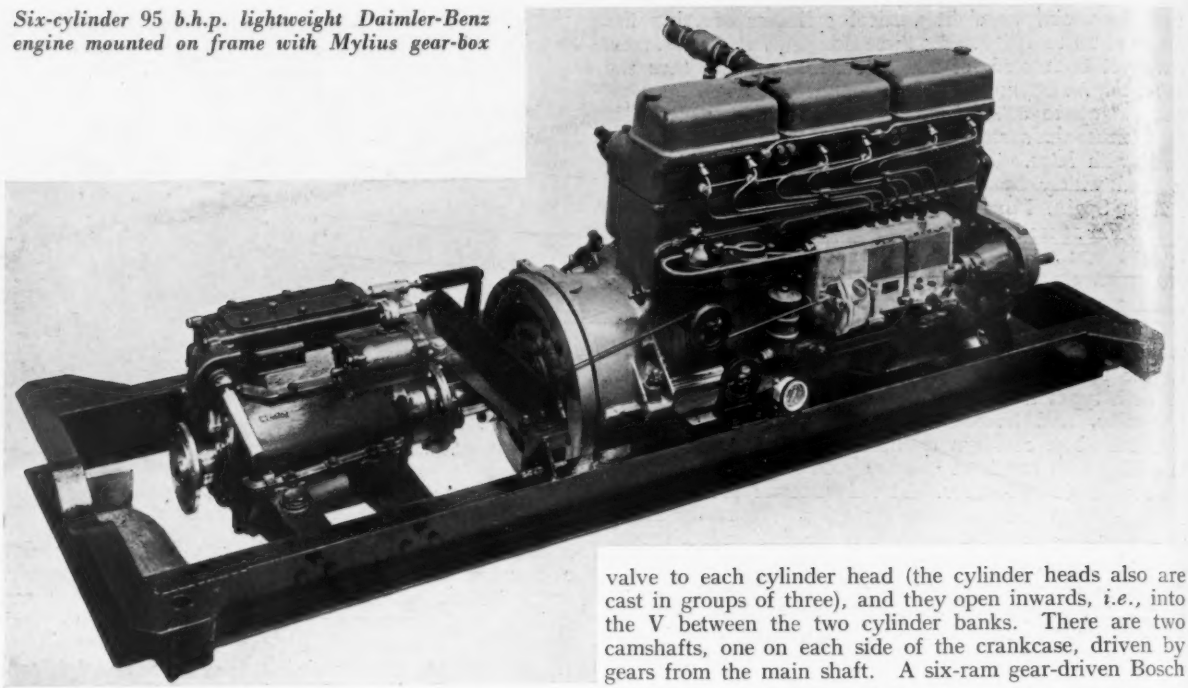
studs, the construction eliminating any difficulty of making a common joint between the combustion space and the water jacket. A single gear-driven case-hardened camshaft is used for operating the valves of the two cylinder banks, and is located in the top of the crankcase at the point of the V. The crankshaft is of chrome-molybdenum steel with the journals hardened on the Doppel-Duro system, and with the pins and shaft hollow-bored. Seven lead-bronze bearings support the crankshaft. Each pair of opposite cylinders works on a common crankpin, the rod from one cylinder having a big-end which is forked over that of the other. The pistons are of aluminium alloy and carry three pressure and two scraper rings, the latter being arranged one above and one below the gudgeon pin. Two six-ram Deutz pumps supply the fuel to the injection valves, and each pump is located outside the cylinder bank which it feeds. A detailed description of this engine with sectional drawings was published in the issue of this Supplement for February 21, 1936.

Daimler and Mercedes

The Daimler-Benz and Mercedes-Benz engines are with three exceptions of the lightweight high speed type, and no endeavour has been made to produce a locomotive type engine, although one size is used by the Reichsbahn in shunting locomotives. Up to 135 b.h.p. the Daimler and Mercedes range is simply that used for road work with a few modifications necessary to suit railway requirements. The range used in service covers a four-cylinder 50 b.h.p. engine and six-cylinder engines of 75, 90, 95 and 135 b.h.p., and, by Mercedes, 12-cylinder vee engines of 300 and 450 b.h.p., all these values being the continuous rating. The 75 b.h.p. model runs at 1,750 r.p.m. and the 95 b.h.p. size at 1,400 r.p.m., and both are used largely by small German private railways in four and eight-wheeled railcars of light design for lines very often not exceeding 20 miles in length. The four-cylinder engine, type OM 63, develops a continuous output of 60 b.h.p. at 1,100 r.p.m. and 65 b.h.p. at 1,200 r.p.m. according to the duty. Its cylinders are 125 mm. by 170 mm. This is the model used in the loco-tractors.

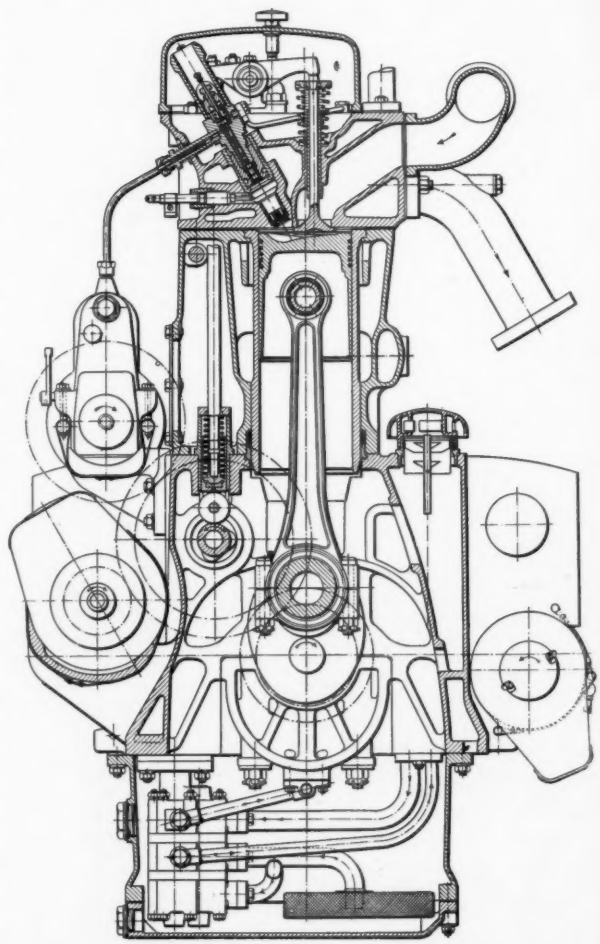
The six-cylinder 135 b.h.p. engine (type OM 54) is used in four-wheeled cars by the German State Railway and the Norwegian State Railways. It was rated originally at 120 b.h.p., but operating experience showed that the continuous rating could be raised by 12 per cent. The maximum rating is 150 b.h.p. at the same speed, viz. 1,500 r.p.m. This engine has been built under licence

Six-cylinder 95 b.h.p. lightweight Daimler-Benz engine mounted on frame with Mylius gear-box

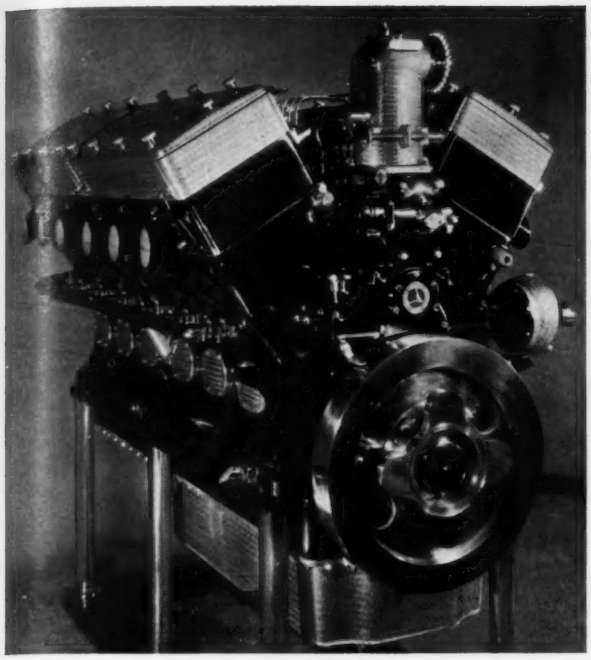


in France by Unic and Codra, by the first-named licensee for road work only, and by Codra for railcars. The cylinders have a bore and stroke of 125 mm. by 170 mm. respectively, a compression ratio of 17·5 to 1, and have the usual Benz pre-combustion chamber; they are of cast iron in blocks of three, and are mounted on a separate cast-iron crankcase below which is carried a very flat sump having a deep well at one end. The inlet and exhaust valves have a diameter of 53 mm. and a lift of 12 mm. and are operated from a gear-driven camshaft located halfway between the crankshaft and the cylinder block. The same set of gears also drives the Bosch fuel injection pump, which is set for an injection pressure of only 950-1,000 lb. per sq. in. The cylinder heads are of iron, cast in threes, and the rocker gear above them is encased in aluminium covers, also in groups of three. Elektron pistons with one scraper and four compression rings are used; they weigh 5 lb. each, and are connected through fully floating gudgeon pins to nickel-steel connecting rods 14½ in. long. The crankshaft is hollow-bored throughout and runs in seven bronze-backed bearings with a lining of lead-zinc whitemetal, three large ones at the ends and centre, and four narrower ones between. These bearings are supported by stiff transverse girders cast integral with the crankcase, and have rigid bearing caps below; the bolts through these caps pass, in the five intermediate bearings, through the transverse webs of the crankcase to the cylinder blocks. The weight is approximately 17 lb. per b.h.p. on the continuous rating.

The 12-cylinder vee engine type OM 85 was developed in 1933 and is used in single-unit railcars of the Reichsbahn and in a single car of the Belgian National Railways. The cylinders are cast in blocks of three, two blocks to each bank, and have wet liners of chrome-nickel cast iron; they have a bore and stroke of 138 mm. by 170 mm. and develop the continuous output of 300 b.h.p. at 1,500 r.p.m. The maximum output is 330 b.h.p. at 1,700 r.p.m., although actually an output of 360 b.h.p. at this speed has been recorded. The weight is 4,000 lb., equivalent to 13·4 lb. per b.h.p. on the continuous rating. There is one inlet and one exhaust valve to each cylinder head (the cylinder heads also are cast in groups of three), and they open inwards, *i.e.*, into the V between the two cylinder banks. There are two camshafts, one on each side of the crankcase, driven by gears from the main shaft. A six-ram gear-driven Bosch



Cross-section of 135 b.h.p. Mercedes-Benz engine



450 *b.h.p. 12-cylinder Mercedes-Benz engine running at 1,400 r.p.m.*

fuel pump is arranged on the outside of each bank, and feeds the fuel through Benz pre-combustion chambers and atomisers. The cylinder blocks are mounted on a common crankcase, cast of silumin, which is brought down below the seven main bearings, which are of the same composition as those of the 135 b.h.p. engine. Mainly in order to obtain the shortest possible engine, the connecting rods of opposite cylinders are articulated, and both big-ends and articulation joints have Carobronze (phosphor-bronze) bearings working on hardened journals. Dry sump lubrication is provided, with a dual geared pump in the sump recess driven by means of a helical gear off the right camshaft. A more detailed description of this engine will be found in the issue of this Supplement for March 23, 1934.

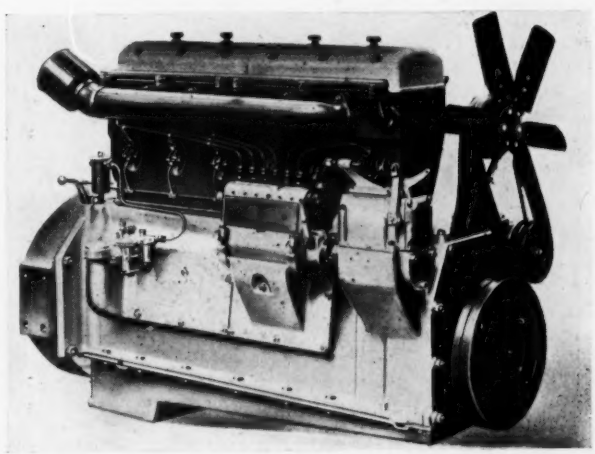
A still larger 12-cylinder vee engine, type OM86, has been built by Mercedes. It has a continuous output of 450 b.h.p. at 1,350 to 1,400 r.p.m. and a maximum capacity of 550 b.h.p. at 1,600 r.p.m., developed in cylinders with a bore of 165 mm. and a stroke of 195 mm., and on a weight of 11·8 lb. per b.h.p. on the continuous rating. Despite the increase of 50 per cent. in the continuous output compared with the OM85 engine, there is no increase in overall dimensions, the length being 73 in., the greatest breadth (excluding the exhaust manifold) 44 in., the distance between the fixing bolts on the carrying frame 26½ in., the greatest height above the crankshaft 42 in., and below the crankshaft 17¾ in. As in the OM85 engine, which it resembles in principles of construction, the single-piece crankcase is of silumin and the four cylinder blocks in special cast iron. The cylinder heads, also in groups of three, are of chrome-nickel cast iron, and contain two inlet and two exhaust valves for each cylinder, this being one of the principal differences compared with the 300 b.h.p. OM85 engine. As before, there are two gear-driven camshafts and two six-ram Bosch fuel pumps delivering fuel through Bosch injection nozzles set in the pre-combustion chambers, which incidentally contain heating plugs for easy starting when cold. Bosch electric starting motors and lighting dynamos also are considered as standard equipment. The arrangement and design of the connecting rods, crankshaft, lubrication system, cooling water circuits and auxiliaries are based upon those of the OM85 engine, but the light-alloy pistons carry one scraper and six pressure rings compared with the one and four of the smaller engine. The fuel consumption is about the same as, or slightly better than, that of the OM85 engine, *viz.* 0·43 lb. per b.h.p.hr. at continuous rating at 1,400 r.p.m., and 0·40 lb. at three-quarter load at 1,100 r.p.m.

According to Herr Stroebe, the Reichsbahn railcar chief, the German State Railway intends to instal in some triple-car diesel-electric trains being built for fast point-to-point services in the Ruhr, Daimler (Mercedes) engines of the same general type as those which were incorporated in the Zeppelin *Hindenburg*. Two sizes of Mercedes aircraft engines are in production. The larger, a 16-cylinder vee model with a continuous rating of 1,100 b.h.p. at 1,500 r.p.m., is that actually installed in the *Hindenburg*. It has a two-piece silumin crankcase carrying steel cylinder blocks, and the cylinder heads, carrying the Benz pre-combustion chamber and two inlet and two exhaust valves, also are of steel. On the continuous rating the fuel consumption is 0·4 lb. per b.h.p.hr. and the weight 4 lb. per b.h.p., but it is only natural that for railway service the weight will be increased and some modifications made. The second Mercedes aviation model has been developed specially for aeroplanes and weighs only 2·9 lb. per b.h.p.

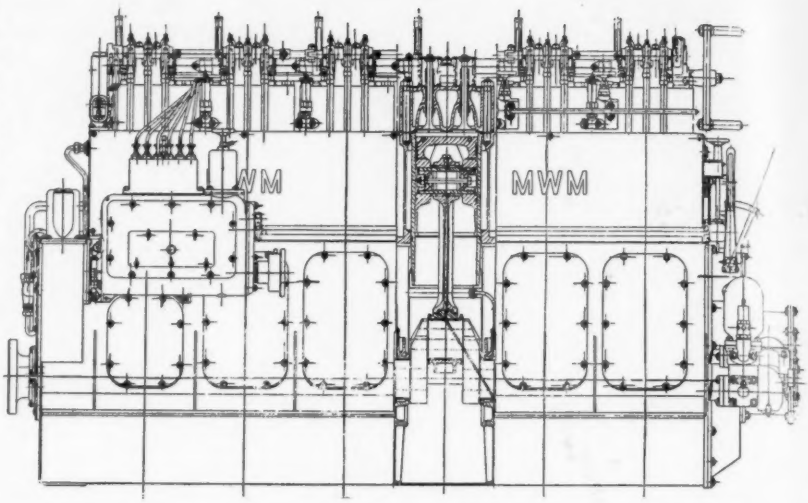
M.W.M.

Another of the German pre-combustion chamber engines is that built by the Motorenwerke Mannheim (M.W.M.) in the Munich works of its subsidiary company, the Suddeutsche Bremsen A.G. In the smaller sizes the engines used for rail traction are the types evolved for road service, but in the higher power range there are special railcar engines of 170 and 300 b.h.p. The smallest engine, type GS17V, is used in loco-tractors; it develops 62 b.h.p. at 1,100 r.p.m. in four cylinders.

Among the smaller sizes the SS17S type is given a continuous rating of 115 b.h.p. at 1,400 r.p.m. with a temporary rating of 130 b.h.p. The six cylinders are 125 mm. by 170 mm. and the engine weighs (inclusive of flywheel) 24 lb. per b.h.p. The crankcase is cast integrally of light alloy and supports two cast-iron cylinder blocks, each comprising three cylinders, into the barrels of which are dropped cast-iron liners of the wet type. The cylinder



115 *b.h.p. M.W.M. engine as used in Korean railcar*

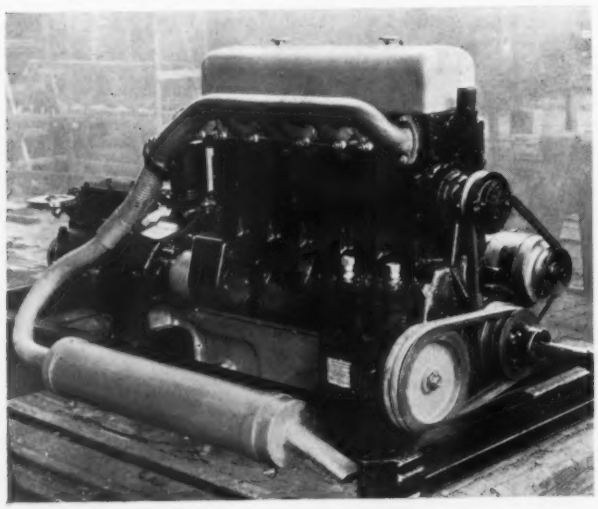


General arrangement of RS125S type 300 b.h.p. M.W.M. engine used in German railcars. The cylinder block is in one piece, with separate covers. The big-end and main bearings are of white metal with bronze backing, and the crankshaft is hollow-bored throughout. This engine is direct-coupled to a generator, and both are mounted on one bogie

heads also are cast in threes, of iron, and they contain a pre-combustion chamber of almost spherical shape. In its action this chamber resembles an air cell rather than a pre-combustion chamber, for the fuel is injected through a Bosch pump and atomiser against a grill covering the neck between the ante-chamber and the combustion space proper, and is atomised by the scavenging action of the air from the chamber coming through the grill holes as the piston is driven downwards. The camshaft is located in the crankcase and is operated by the same train of gears as drives the fuel pump; incorporated in the pump is an automatic injection advance device. Aluminium alloy pistons are used and they are fitted with fully-floating gudgeon pins located by Seeger rings. A 6 h.p. 24-volt Bosch starting motor and a 24-volt 500-watt lighting dynamo form part of the standard equipment when mechanical transmission is used. At full load, full speed the fuel consumption is 0·43 lb. per b.h.p.hr., and the lubricating oil consumption 5 gr. per b.h.p.hr. Overall, the engine measures 62 in. long by 25½ in. wide by 44 in. high.

The M.W.M. company has another type of engine of almost the same power, but running at a slower speed. It has a continuous rating of 125 b.h.p. and a top capacity of 150 b.h.p. at 1,000 r.p.m. on a weight of 3,970 lb. The six cylinders are 150 mm. by 200 mm., and are of cast iron mounted on a light alloy crankcase. In this case the fuel injection is on the direct system, but in the next larger size—170 b.h.p. continuously at 800 r.p.m. in six cylinders 175 mm. by 240 mm.—a pre-combustion chamber is used. The latter size weighs 31 lb. per b.h.p. on the continuous rating and has a maximum short-time capacity of 225 b.h.p.

For installation in the same type of double-bogie railcar as the 300 b.h.p. 12-cylinder vee Mercedes engine, M.W.M. constructed a six-cylinder vertical engine developing 300 b.h.p. at 1,100 r.p.m. and having a top output of 350 b.h.p. The cylinder bore and stroke are 200 mm. by 250 mm., and M.W.M. pumps and atomisers have been adopted to lead the fuel into the pre-combustion chamber, at an injection pressure of 1,100 to 1,475 lb. per sq. in. In this case both the cylinder block and the crankcase are of cast iron, as are the wet-type liners. A feature of this engine is the extremely large inspection doors in each side of the crankcase, and another, shared with all M.W.M makes, is the extreme care taken to filter properly the intake air, the fuel, and the lubricating oil. This 300 b.h.p. engine was illustrated and briefly described in the issue of this Supplement for October 6, 1933.



Magirus 65 b.h.p. railcar engine together with silencer and a Mylius gearbox on one subframe

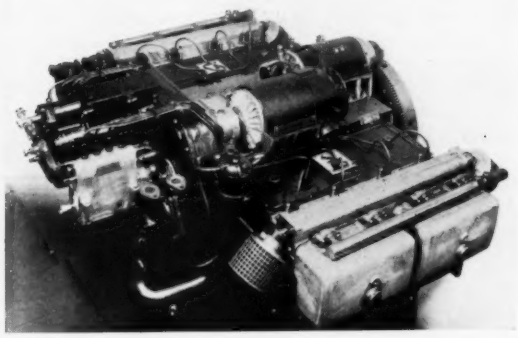
Magirus

The engine made by the C. D. Magirus A.-G. is a newcomer to railway traction although it has been in use for years on lorries and road buses. At the moment, the only railcar applications are on small German private lines with the six-cylinder 65/72 b.h.p. size, which develops the top output at 2,000 r.p.m. and the continuous rating (65 b.h.p.) at about 1,800 r.p.m. The cylinders are 88 mm. by 125 mm.; they are cast of iron, integrally with the crankcase, and neither wet or dry cylinder liners are used. The six cylinder heads are cast *en bloc* and contain pre-combustion chambers, and the compression ratio reaches the high value of 19·5 to 1. The pistons are of Nelson-Bohnalite and carry one scraper and four oil pressure rings; the crankshaft has oval webs without any balancing prolongations, and is hollow bored only through the crankpins. The main and big-end bearings have white-metalled bronze shells and the journals are surface-hardened. Bosch pumps and atomisers inject the fuel at a pressure of 1,100-1,400 lb. per sq. in. This 65 b.h.p. engine (maker's classification S88D) weighs 1,100 lb. including flywheel and auxiliaries, or 17 lb. per b.h.p

At full load and speed the fuel consumption is high, 0·48 lb. per b.h.p.hr., but drops to 0·45 lb. at three-quarter load; the torque is well maintained with increasing speed, falling from its maximum of 27 mkg. (195 lb. ft.) at 1,300-1,500 r.p.m. to 25·8 mkg. (187 lb. ft.) at 2,000 r.p.m. Magirus also makes a "boxer-motor" or horizontally-opposed engine developing 150 b.h.p. at 2,000 r.p.m. in 12 cylinders having a bore and stroke of 95 mm. and 125 mm. respectively. It weighs about 12½ lb. per b.h.p., has a brake m.e.p. of 91 lb. per sq. in., and a piston speed of 1,640 ft. per min.

D.W.K.

The four-stroke vertical engines made by the Deutsche-Werke Kiel A.-G. were applied in railway service only to locomotives until about 12 months ago, since when several 110 b.h.p. engines have been installed in railcars. A considerable amount of success has been attained by



180 b.h.p. eight-cylinder horizontal engine built by Deutsche Werke Kiel

this builder's 180 b.h.p. horizontal engine, which, although used only in small numbers, paved the way for the Reichsbahn's standard horizontal engine of greater power, which will be described later.

The 2 × 4 V18L engine has a continuous rating of 180 b.h.p. at 1,500 r.p.m. and a top rating of 200 b.h.p. The eight cylinders with a bore and stroke of 128 mm. and 180 mm. respectively are arranged in two opposing banks, the common crank chamber and two cylinder blocks being cast integrally, of iron. The cylinder heads are cast in pairs, and contain Lanova air cells, this being the first railway application of this well-known combustion chamber of which we have record. (See issue of this

D.W.K. Horizontal Oil Engines

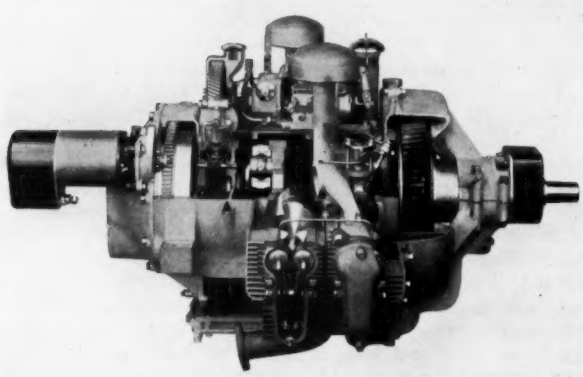
No. of cylinders	8	12	12
Maker's model	2x4V18L	12V19	12V19 (A)
Supercharged	No	No	Yes
Continuous output .. .. b.h.p.	180	275	400
Speed at continuous output .. r.p.m.	1,500	1,500	1,500
Cyl. bore and stroke .. .. mm.	128 × 180	130 × 190	130 × 190
Weight, empty but with starter .. lb.	2,940	5,000	5,400
Brake m.e.p. .. lb. per sq. in.	83	79	112
Piston speed .. .. ft. per min.	1,775	1,870	1,870

Supplement dated June 16, 1933 for description of Lanova air cell). The five bearings of the four-throw crankshaft are lined with lead bronze, and each pin carries two big-ends, one forked over the other. Fuel is fed to the cylinders by two four-ram Bosch pumps mounted on one end of the engine, and a Bosch electric starting motor is mounted on top of the crankcase. There are separate camshafts for each bank, and they operate one inlet and one exhaust valve per cylinder. Without starting motor or lighting dynamo the engine scales 15 lb. per b.h.p. The fuel consumption is 0·44 lb. per b.h.p. hr.

Miscellaneous German Engines

Among the railcar engine types less widely used are those by Vomag, Krupp, Linke-Hoffman, and, in Germany itself, by Junkers. The Vomag engine is made both in vertical and horizontal designs, the standard horizontal unit having eight cylinders 135 mm. by 180 mm. all on one side of the crankshaft. It has a continuous rating of 185 b.h.p. at 1,500 r.p.m. and an overload capacity of 200 b.h.p. at the same speed. It weighs 22 lb. per b.h.p., and has an integral cylinder block and crankcase of light metal housing cast-iron wet liners. A description of this engine, with sectional drawing, appeared in the issue of the *Diesel Railway Traction Supplement* for February 21, 1936. Vomag makes also a series of four-stroke vertical engines, of which two powers have been used in German railcars, viz., four-cylinder, developing 78 b.h.p. at 1,500 r.p.m., and six-cylinder, developing 115 b.h.p. at the same speed; in each case the cylinders are 110 mm. by 160 mm., and Bosch fuel pumps and starting motors are incorporated. Two of the horizontal engines rated at 165 b.h.p. continuously are installed in a double-bogie car belonging to the Neu Ruppiner Railway.

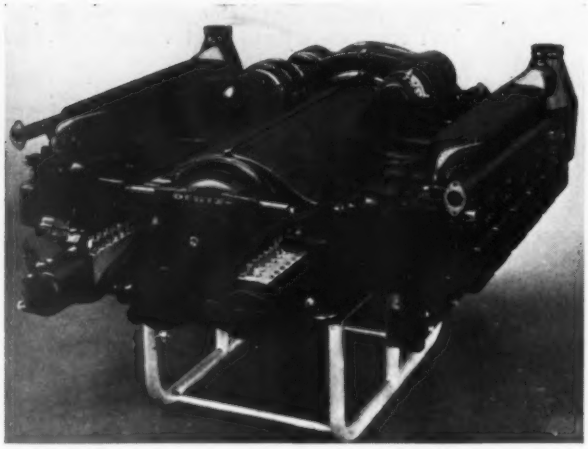
Krupp always has concentrated more on locomotive oil engines so far as railway work is concerned, but the lorry type of four-stroke vertical engine has been built by the French licensee, Delaunay-Belleville, and has been installed in small railcars on the P.L.M. Railway. This engine has four cylinders 135 mm. by 200 mm. and the



55/60 b.h.p. Krupp horizontal air-cooled engine

continuous output of 65 b.h.p. is attained at 1,000 r.p.m.; the maximum loading is 78 b.h.p., and the weight 26 lb. per b.h.p. on the continuous rating. The cylinder block is of cast iron, and has liners inserted. It is supported on a one-piece silumin crankcase which carries a nickel-chrome steel crankshaft running in five whitemetalled bronze-backed bearings. Aluminium alloy is used for the connecting rods as well as for the pistons. Krupp also has a 55/60 b.h.p. horizontally-opposed air-cooled engine which was being installed in a railcar in Spain when civil war broke out in that country.

The Linke-Hoffmann engine has been used only outside of Germany, and in the 380 b.h.p. size. It is a slow speed engine and at the normal full-load rating runs at 650 r.p.m. The six cylinders are 240 mm. by 340 mm. The Junkers opposed-piston engine has only one application in Germany, but it is used extensively in France, and will be described when dealing with the engines built



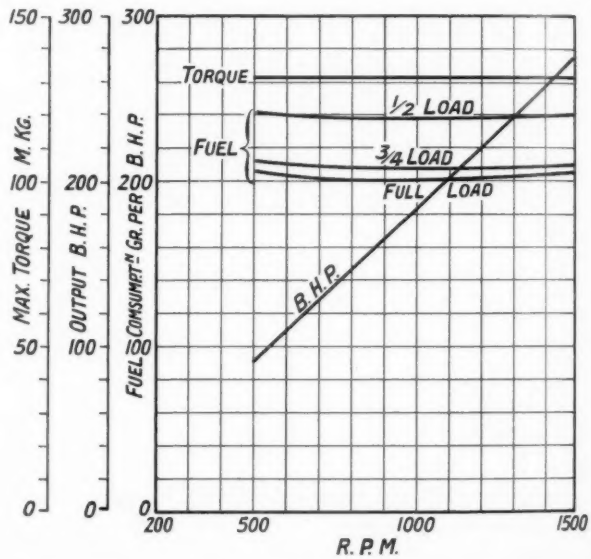
German standard 275 b.h.p. horizontal engine as made by Deutz

in that country. The German application is a three-cylinder engine of 90 b.h.p., the cylinders, of course, having two pistons each.

German Standard Horizontal Engine

Collaboration between the Reichsbahn and various German engine makers has led to the production of a 12-cylinder horizontal engine of 275 b.h.p. which can be, and is, made by four companies. The essential connections, auxiliaries (such as starters, pumps and filters) and certain main components are the same, but the details vary according to the general practice of the particular maker, as apart from the above details and the power and speed, the Reichsbahn laid down virtually no stipulations. These engines are now made by D.W.K. (who made the original 180 b.h.p. engines already described); Deutz; Daimler; and M.A.N. The cylinders of all are 130 mm. by 190 mm. and the continuous output of 275 b.h.p. is obtained at 1,500 r.p.m., giving a brake m.e.p. of 79 lb. per sq. in. and a piston speed of 1,870 ft. per min. The idling speed is 500 r.p.m. and the weight 4,500 to 5,000 lb. All makes have pre-combustion chambers and Bosch fuel pumps. The following notes refer more particularly to the Deutz-built engines. The central crankcase is of cast iron; it is divided by a vertical joint into two parts, one of which carries the seven crankshaft bearings. The crankshaft is of chrome-molybdenum steel with main and crankpin journals hardened on the Doppel-Duro process and running in bearing shells lined with whitemetal. Balance weights are attached to prolongations of the crankwebs. The connecting rods are not articulated, two separate rods being arranged to work on the same pin. The pistons are of aluminium alloy and carry one scraper and three pressure rings.

The D.W.K. 275 b.h.p. horizontal engine (maker's type 12V19), follows in many respects the 180 b.h.p. engine, but of course has cylinders of the "standard" size. The cast-iron crankcase is in two portions, bolted together, with the seven crankshaft bearings housed in one part. The crankshaft itself differs from that of the 180 b.h.p. eight-cylinder engine in having counterbalance weights formed by prolongation of the webs, but the arrangement of the connecting rod big-ends is the same, one rod being forked and fitting over the other. The crankcase half on each side is cast integrally with the adjacent cylinder block. Individual castings are used for the cylinder heads, and each contains a pre-combustion chamber and one inlet and one exhaust valve. There are two gear-driven camshafts, one to each cylinder bank. At one end of the engine is a flywheel, an air filter and the lubricating oil pump, and at the other end are arranged the two six-ram Bosch fuel pumps, the fuel feeding pump, the cooling water pump, tachometer drive, a double fuel filter, lubricating oil filter and flanges for the governor connection. The engine weighs 4,900 lb. empty and without starter or silencer; with these auxiliaries and 130 litres of water and 90 litres of oil, the weight is about 5,850 lb.



Fuel consumption, torque and power output of Deutsche Werke Kiel 12-cylinder engine

The first of the new high-speed diesel-electric Rocket trains of the Chicago, Rock Island and Pacific Railroad

A Small Industrial Shunting Locomotive

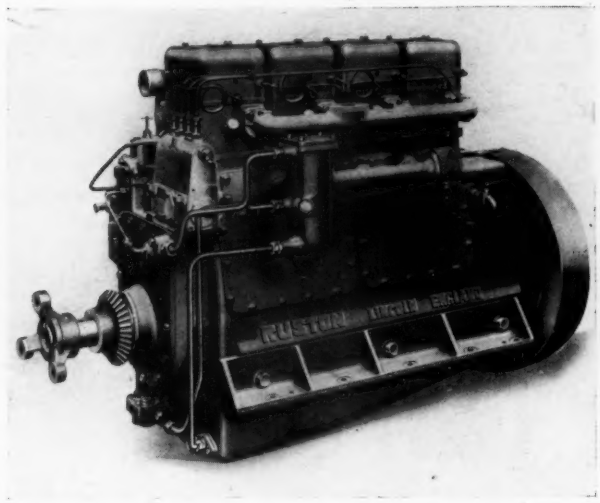
*

THE latest development of the Ruston diesel-mechanical shunting locomotive is a 44/48 b.h.p. four-wheeled machine designed specially for arduous service in works yards and harbours. Running on the standard gauge, it has a wheelbase of 5 ft. 3 in., an overall length of 13 ft. 6 in., and a height of 10 ft., and under good conditions its maximum drawbar pull of 3,500 lb., up to 3 m.p.h., enables trains of 175 tons weight to be hauled on the straight level. In full working order the locomotive weighs about 7½ tons, giving an adhesive factor of 4·8. Curves of 50 ft. radius can be traversed. The wheels are of the disc type without separate tyres and have a diameter of 27 in.

Engine and Transmission

A four-stroke four-cylinder Ruston oil engine forms the power unit, and its crankcase incorporates a frame which is fixed directly to the locomotive frame structure. The crankcase and cylinder block are cast integrally, but each head is a separate casting. A C.A.V.-Bosch fuel injection pump is fitted at the non-flywheel end of the engine. Centrifugally-cast wet-type liners are inserted in the cylinder block, and in them run cast iron pistons fitted with one scraper and three pressure rings. The connecting rods are drop stampings, with phospor bronze gudgeon pin bearings and phosphor-bronze whitemetalled big ends. The crankshaft bearings also have whitemetal linings.

The torque is taken through a flexible coupling to a gearbox of the three-speed constant-mesh type giving track speeds of 3, 4½ and 7 m.p.h. in each direction, the corresponding drawbar pulls being 3,500, 2,440 and 1,520 lb. Each gear is provided with its own plate clutch lined with an asbestos composition, and works in oil. The gears are of alloy steel with hardened teeth, and the shafts have ball or roller bearings. The gearbox also is mounted directly on the locomotive frame structure, and the drive from its final shaft (near the centre of the locomotive wheelbase) to the axles is by means of roller chains, which have radius rods between the frame and axleboxes to provide easy chain adjustment. The locomotive frame structure itself is comprised mainly of rolled steel sections arranged longitudinally with transverse stays of plate, and with massive buffer beams raised above frame level to take standard buffing and drawgear. The axleboxes have bronze bearings and dust proof shields and are supported by overhung laminated springs.

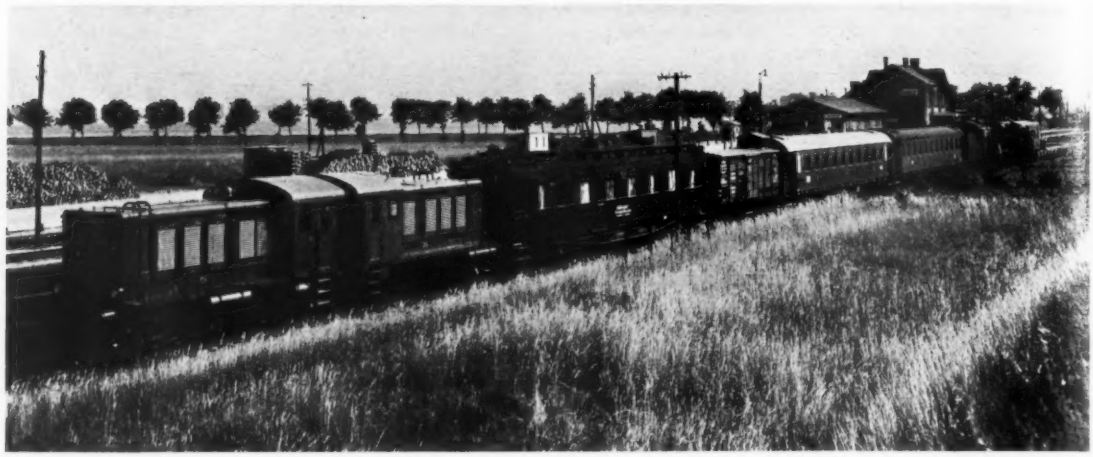


48 b.h.p. four-stroke Ruston oil engine

AFRICAN LOCOMOTIVES.—The Drewry Car Co. Ltd. has received an order from the Sudan Government Railways for three diesel-mechanical shunting locomotives for 3 ft. 6 in. gauge lines. All are to be fitted with Wilson-Drewry four-speed epicyclic gearboxes and Vulcan-Sinclair fluid couplings. Two of these locomotives will have the 0-6-0 wheel arrangement and will be powered by six-cylinder four-stroke Gardner engines of the 6L2 type, developing 74 b.h.p. The third locomotive is to have a four-cylinder Gardner engine developing 50 b.h.p. The design of these locomotives is of the Drewry standard type, but special attention is being given to the details to suit them for operation in torrid climates.

New Ruston shunting locomotive engaged in typical duty

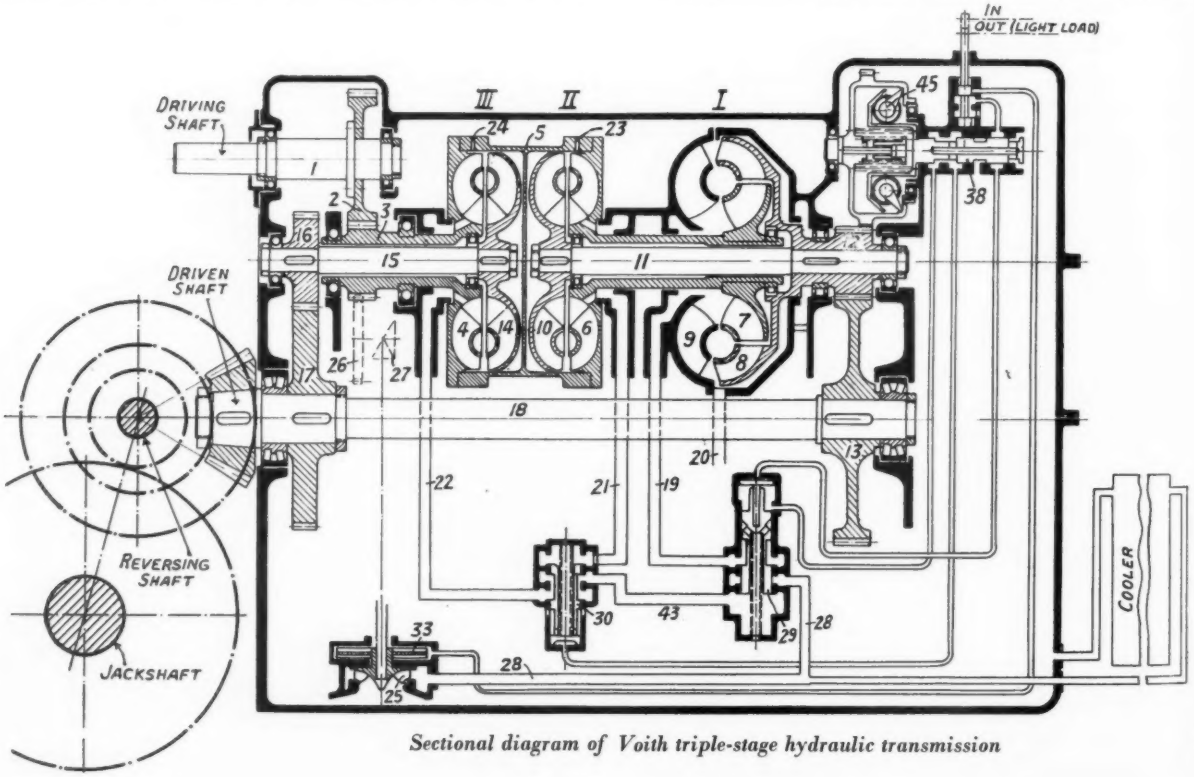
DIESEL-HYDRAULIC LOCOMOTIVE ON THE CONTINENT



Test train with two 360 b.h.p. diesel locomotives coupled in multiple-unit, and containing a dynamometer car and brake locomotive

A MEDIUM-POWER diesel locomotive has just been introduced in Germany by the Berliner Maschinenbau A.G., a firm which has built diesel locomotives for a dozen years. Operating on the standard gauge, the new unit is of the four-wheeled type and is intended mainly for freight traffic, although it is suitable for passenger or mixed train working where speed limitations are severe, for the maximum speed is kept to 28 m.p.h. Six-wheeled locomotives of the same general construction are now being built at the Wildau works.

Weighing 36 tons in working order, the four-wheeled units have 43½-in. wheels spread over a base of 11 ft., and have a length over buffers of 28 ft. 6 in. The maximum drawbar tractive effort is 24,200 lb., falling to 5,250 lb. at 11 m.p.h., and being maintained at that figure up to 17 m.p.h., when it drops to 2,850 lb. and remains at that value up to 28 m.p.h. These special speed-tractive effort characteristics are due to the incorporation of a triple Voith (Voith-Sinclair in England) hydraulic transmission, with step-up gear, as shown in the accompanying sectional diagram. Thanks to the use of this transmission, multiple-unit control is possible without much complication, and actually was installed in two of the locomotives during some dynamometer car trials undertaken by the Reichs-



Sectional diagram of Voith triple-stage hydraulic transmission

bahn. The power unit, together with its cooler and auxiliaries, is mounted beneath the bonnet in front of the driving cab, and is a four-stroke Deutz engine developing a continuous output of 360 b.h.p. at 600 r.p.m. in six cylinders with a bore and stroke of 240 mm. by 360 mm. respectively.

Voith Transmission

The hydraulic transmission is of the Voith three-stage type, comprising a turbo-converter element and two hydraulic couplings, and it gives an efficiency of 80 per cent. or more over practically the whole range from 30 to 100 per cent. of the track speed. Over the first stage, in this example from zero up to 11 m.p.h., it is the converter which is in operation; in the second stage, from 11 to 17 m.p.h., the first coupling is used; and in the last stage, from 17 to 28 m.p.h., the second coupling is used. The primary parts of the converter *I*, and of the first and second couplings, *II* and *III*, are driven at the same rate of rotation from the driving shaft *1* through the step-up gearing *2* and *3*. The drive of the secondary part of the first coupling is transmitted to the reversing and jack shafts through shaft *11* and gears *12* and *13* and shaft *18*, the drive of the secondary part of the second coupling is transmitted through shaft *15* and gears *16* and *17*. The torque from the converter also goes through gears *12* and *13* and along shaft *18*. The hydraulic circuits of the various stages are filled or emptied by the fluid gear or control pump *25*, which delivers into the turbo converter through pipe-line *28*, the control valve *29*, the pipe *19*; the lead to the couplings also goes through *28* and *29*, and along pipe *43* to a second control valve *30*, thereafter dividing, the lead to the first coupling *II* being *via* pipe *21* and that to the second coupling *III* by way of pipe *22*.

Those parts sectioned in black in the accompanying diagram are part of, or rigidly attached to, the fixed casing. Item *9* is the fixed guide wheel of the converter, the reaction of which makes torque conversion possible; *8* is the turbine runner, and *7* the impeller. In the first coupling *6* is the impeller and *10* the turbine runner, and in the second coupling *4* is the impeller and *14* the turbine runner. The casing *5* is common to the two couplings. Both the converter and coupling units have calibrated leakage ports through which the oil passes back into the sump of the casing (*20* in the converter and *23* and *24* in the couplings), the units themselves being kept full by the action of the pump *25* driven through spur gear *26* and bevels *27*. Above the pump *25* is another set of blading *33* which supplies oil to the speed pre-selecting valve *38* and the driving control mechanism.

The mechanical portion of the locomotive is built upon a heavy plate frame structure, carrying the engine and transmission directly, and housing the jackshaft and its bearings, from which the drive is taken to the wheels through coupling rods. Compressed air brakes of both straight and automatic types are used, and the former applies one block on each wheel.

Publications Received

Fuel Injection Equipment for Oil Engines.—In diesel railway traction there are few items so puzzling to the maintenance staff as the fuel pumps of railcar oil engines, and it must be admitted that frequently a running fault in the engine may be attributed to inexpert, and probably unauthorised, tampering with the fuel pump. This brochure just issued by C.A.V.-Bosch Limited, and obtainable from that firm at Acton, London, W.3, is designed to give operators the how, why, when and where of fuel pumps, and is an amazingly informative little work. A thorough study of it by everyone concerned with the running or maintenance of engines should be considered essential by all railways owning railcars or road vehicles fitted with C.A.V.-Bosch injection equipment, and a reference copy might well be kept in every railcar running shed.

Fuel Oil for Diesel Engines.—London: British Standards Institution, Specification No. 209-1937. Price 2s. net.—Probably there has been no single item which has caused so much trouble in railway oil engines as the use of unsuitable fuel, yet strangely enough the possibility of correction in this direction has been overlooked, perhaps due to the utter ignorance of mechanical engineers generally as to what makes a good fuel. This latest specification of the B.S.I. supersedes one introduced 13 years ago, and recognises the requirements of present-day high-speed engines for something special in the way of fuel. The actual specification for this, while including certain stipulations as to distillation and aniline point, &c., does not seem to place much importance on the initial boiling point, distillation temperature and chemical characteristics, which usually mean far more from the standpoint of good combustion than the old bases of viscosity and gravity. Nevertheless, used with discretion as a basis on which to find the right oil for each particular class of engine, the latest B.S. specification should be welcome. The greater part of the complete specification is comprised of instructions for the determination of viscosity, asphalt and water contents, carbon, sulphur, pour point, and other desired characteristics. The final appendix describes the method to be used for the determination of the calorific value.

Elsner's Taschenbuch für den Reichsbahn-Kraftverkehr. Berlin, S.42. 1937: Otto Elsner Verlagsgesellschaft. 398 pp. 6¼ in. by 4 in. 145 figures. Price RM. 3·50.—In three main sections this handbook covers the application of lorries, railcars, and loco-tractors to the transport requirements of the German State Railway. The power units comprise petrol, diesel and producer-gas systems. The longest section is that dealing with railcars, and it gives cameo descriptions, generally accompanied by small-scale diagrams and photographs, of all the classes of internal-combustion railcars. There are notes and one or two tables on the principal types of engines installed, and brief references to the systems of transmission, except for the Voith hydraulic drive, the double turbo type of which is given a small folding plate containing sectional diagrams. Short references are made also to the repair and maintenance organisations, the testing and observation of the engines after repair, and the use of hydraulic brakes on test beds. Specimen cards are reproduced for the collation of all the relevant data on the designs of the various railcars. The division of the book dealing with loco-tractors, or *kleinlokomotiven*, is devoted more to a description of the mechanical portion and the engine and electrical equipments, and is illustrated by numerous drawings and half-tones, but following usual German practice, all the arrangement drawings are too small or too indistinct for much useful information to be derived from them. From the non-German point of view the great disadvantage of the book is not that it is written in German, but that it is printed in the irritating characters, which few Englishman, at least, can bring themselves to read, even when the information is of considerable value. Nevertheless, the book certainly is what it is claimed to be in its title, a handbook of motor traction on the Reichsbahn.

NOTES AND NEWS

New American Trains.—The first of the new diesel-hauled Rocket trains of the Chicago, Rock Island & Pacific Railroad has gone into trial operation. It comprises a stainless steel 1,200-b.h.p. Winton-engined diesel-electric locomotive and three light-weight stainless steel passenger cars.

Multiple-Unit Working in Italy.—Arrangements are being made for the installation of special couplers suitable for multiple-unit operation of the numerous Breda diesel cars of the Italian State Railways, which hitherto have worked solo. Similar cars now under construction are being fitted also.

Maybach Engines.—Up to the beginning of April last, the number of Maybach high-speed oil engines supplied for use in railcars and trains was 535, aggregating 189,985 b.h.p., and made up of eight engines of 150 b.h.p., 85 engines of 175 b.h.p., 88 engines of 210 to 225 b.h.p., 303 engines of 410 b.h.p., and 51 supercharged engines of 600 b.h.p.

Algerian Railcars.—The three 300-b.h.p. double-bogie Renault diesel-mechanical cars for the Algerian State Railways, the order for which was recorded in the issue of this Supplement for January 22 last, are almost finished, and it is hoped to put them into service soon between Algiers and Oran on an overall timing of five hours for the 262 miles. Since January the order has been increased from three to five cars.

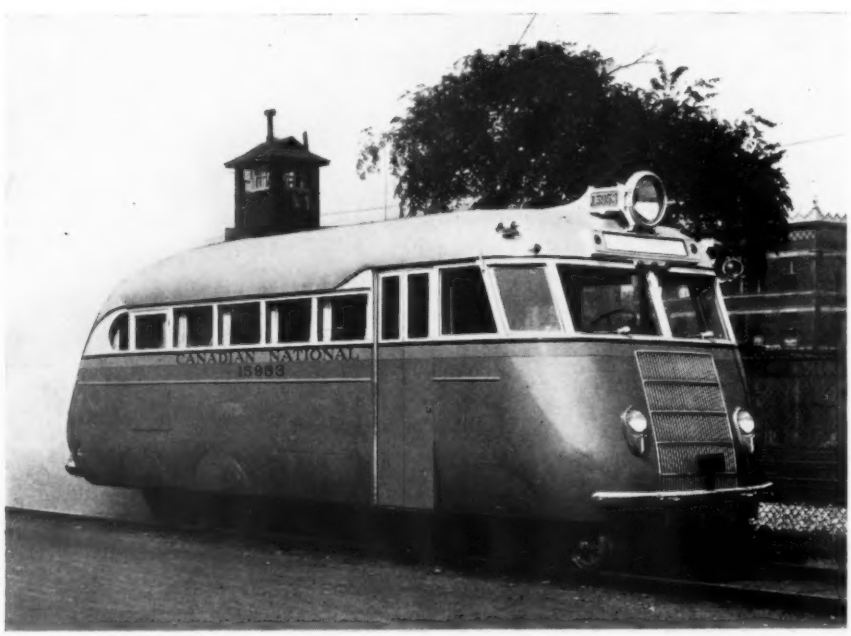
Norwegian Main-Line Developments.—The Norwegian Storting has sanctioned the expenditure of 650,000 kr. (£32,500) for a diesel-electric locomotive of about 4,000 b.h.p. maximum to be used on the Oslo—Bergen main line of the Norwegian State Railways. Further, several high-speed diesel-electric trains are proposed for use over this section, which has heavy grades and lies generally at a high altitude.

Canadian National Road-Railers.—Four petrol-engined vehicles capable of operating both on the roads and on the rail have been set to work in the Atlantic, Central and Western regions of the Canadian National Railways. Three of the cars are 26-seater passenger vehicles and the fourth is fitted up for freight service. According to press reports, Mr. S. J. Hungerford, president of the C.N.R., has said that the cars can be moved from the road on to the rails in one minute.

Small British Diesel Locomotives.—Among the low-power diesel-mechanical locomotives now being built for use in England are an 87-b.h.p. locomotive by Barclay for the Glasgow Corporation, two 137-b.h.p. Crossley-engined locomotives by Robt. Stephenson & Hawthorn's, and five Fowler-Sanders-engined units by Fowler for the Office of Works. In addition, Ruston & Hornsby Limited has introduced a new 48-b.h.p. diesel shunting locomotive with a four-cylinder Ruston engine and a three-speed gearbox.

D.W.K. Horizontal Oil Engines.—Altogether, the Deutsche Werke, Kiel, has delivered to the Reichsbahn 14 of its eight-cylinder 180 b.h.p. horizontal engines, as described in the issue of this Supplement for November 1, 1935, and also on another page in this issue. The first engine has covered well over 80,000 miles in service. In addition, 11 of the larger 12-cylinder 275 b.h.p. horizontal engines have been built, or are in course of delivery, for operation in Reichsbahn railcars. These larger engines also are described elsewhere in this issue.

Italian Diesels for Secondary Line.—Following the trials mentioned on page 268 of the issue of this Supplement for August 6, the Soc. Veneta Ferrovie Secondarie has begun regular diesel railcar operation over the Venice—Adria and Ferrara—Copparo lines, and is making arrangements to introduce similar services on the Ferrara—Modena Railway. According to a statement of the company, it would like to introduce diesel railcars on other lines, but at the moment the initial cost of such vehicles is felt to be too high.



One of the 105 b.h.p. petrol-engined road-railers of the Canadian National Railways. The gearbox gives five speeds up to 80 m.p.h. forward and one slow speed in reverse. The motive power is transmitted to both road and rail through the four rubber-tyred wheels, but when on the rail four small steel flanged wheels are lowered and the steering gear is locked. The small steel wheels share in the carrying of the load when on the rail